ELECTRICAL TIMES

THURSDAY, FEB. 16, 1950

VOL. 117
NO. 3041

EST. 1891

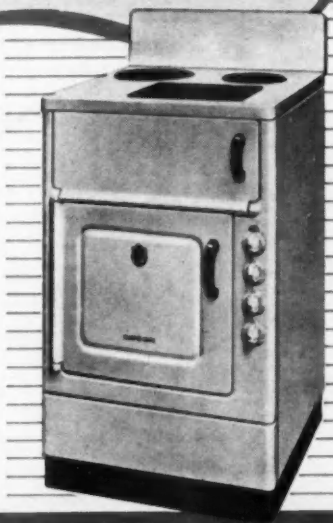
6D

'ENGLISH ELECTRIC' COOKERS

for the kitchen - proud housewife

Model 2009 illustrated has extra large oven

- Balanced - heat oven with Ritemp thermostatic control.
- Rapid boiling or slow simmering.
- Pilot-light indication.
- Cast-iron construction for strength and long life.
- Attractive finish in two shades of cream vitreous enamel.

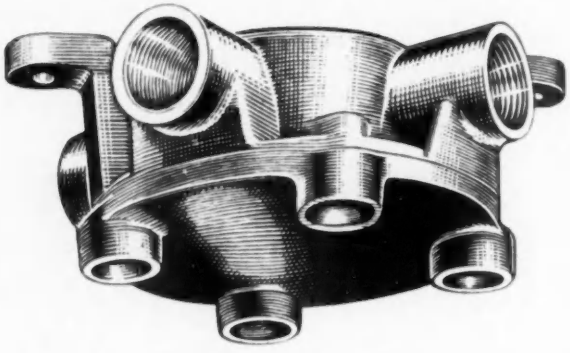


Literature of ENGLISH ELECTRIC Domestic Appliances will be sent freely on request.

The ENGLISH ELECTRIC Company Limited
Domestic Appliance Sales Department
EAST LANCASHIRE ROAD - - - LIVERPOOL, 10

See also "English Electric" Fusegear advertisement, page 27

Flameproof Connection Boxes



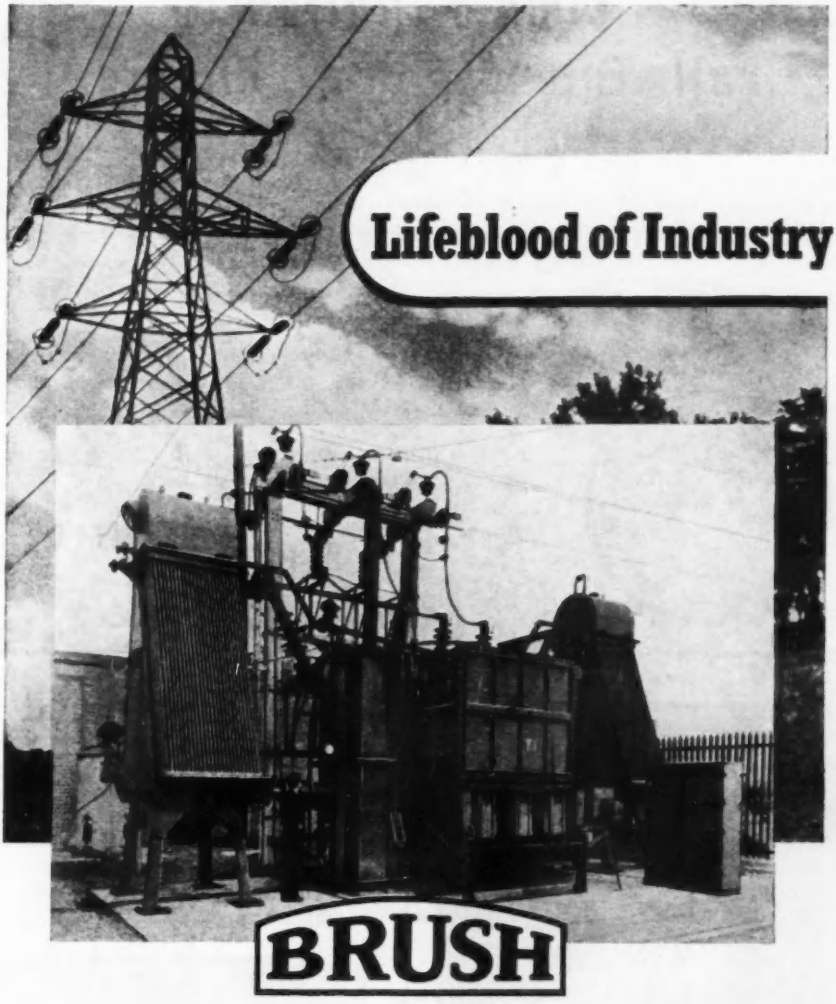
These boxes made in large and small sizes are designed for use at all intersection points of a conduit system and greatly facilitate drawing-through operations. Strongly made and designed to comply with all the special regulations affecting danger areas. M.O.F. & P. Certificate No. FLP 1573. *Standard finish: black enamel (also available galvanized or Z.I.R.) Write for further information*

MADE BY THE HOUSE OF

Simplex

Simplex Electric Company Limited
Oldbury Birmingham and Branches

A TI COMPANY



POWER TRANSFORMERS

Our standard range covers up to 45 MVA at 132 kV

THE BRUSH ELECTRICAL CO. LTD., LOUGHBOROUGH, ENGLAND

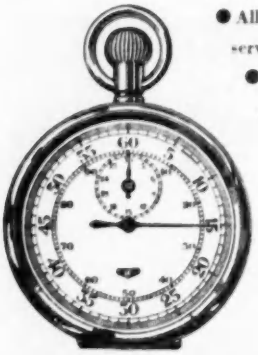
Branches: *London · Birmingham · Cardiff · Manchester · Leeds · Newcastle · Glasgow*

14-37

A

Time & Motion calls for HEUER Timers

"Watch the seconds and the hours will take care of themselves" might be the watchword of any industry with peak production as its target. Heuer Timers, used by industrial concerns the world over, are now available to help with the production drive.



- All parts are standardized and interchangeable, and there is a rapid service for repairs and replacement.
- Owing to licence restrictions we regret we can accept enquiries only for industrial firms engaged on priority or export work.

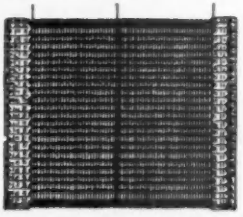
All enquiries should be addressed to the Sole Agents for the U.K.

Baume and Company
1 Hatton Garden, London, E.C.1

Longines WATCHES — HEUER TIMERS — BAUME WATCHES

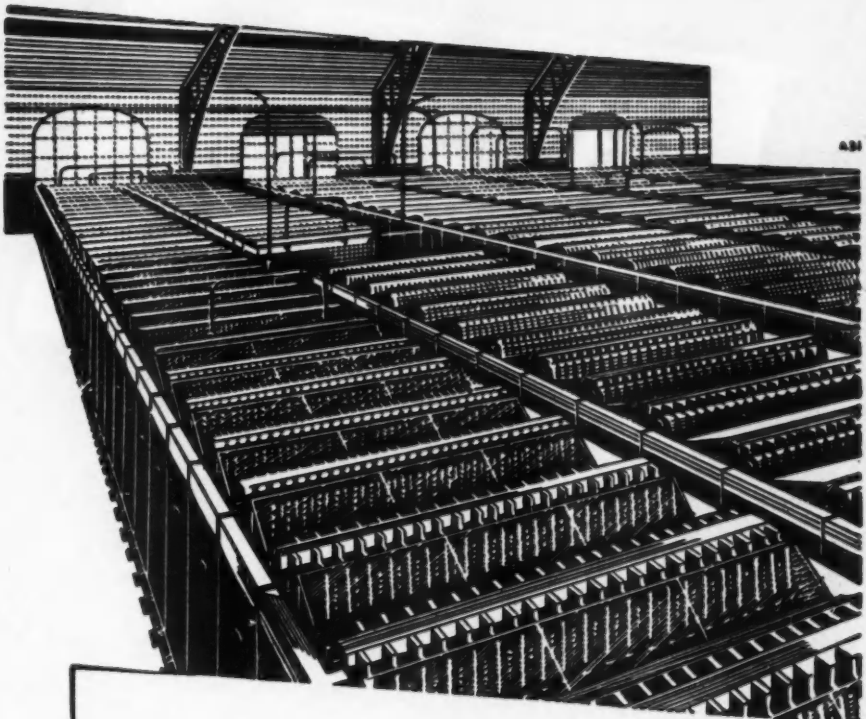
ASBESTOS WOVEN WIRE RESISTANCE NETS

Speedily supplied from stock, or 'made to measure' at a cost that will please you. Our Technical Service will help you with any problems.



CRESSALL

Registered Trade Name of—
The CRESSALL MANUFACTURING CO., LTD.
Tower Street, Birmingham 19
Telephone: ASTon Cross 2666 (3 lines). Telegrams: OMHIC, BIRMINGHAM



Alton is a big name in the export market. These good batteries, in capacities from 10 to 15,000 ampere-hours, are in service in sixty-five countries. Alton is ready to meet orders from any part of the world and to give firm delivery dates

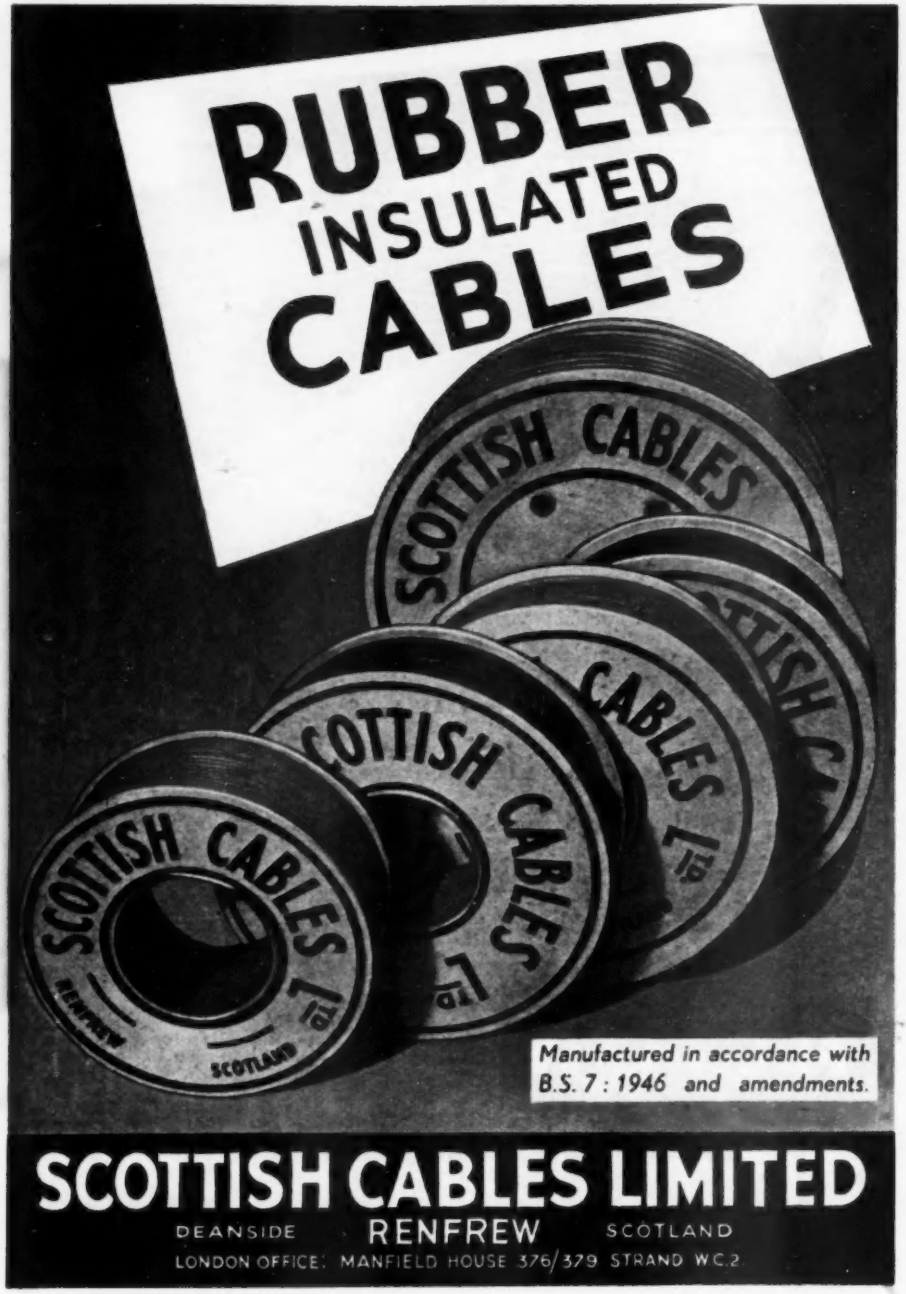
ALTON

BATTERIES OF MERIT

THE ALTON BATTERY COMPANY LTD
Alton, Hants: Telephone: Alton 2267 and 2268
Telegrams: Battery, Alton

Alton can also supply renewal plates for all makes of battery, British & Continental

B


RUBBER
INSULATED
CABLES
SCOTTISH CABLES
SCOTTISH CABLES Ltd
RENFREW
SCOTLAND
Manufactured in accordance with
B.S. 7 : 1946 and amendments.
SCOTTISH CABLES LIMITED
DEANSIDE RENFREW SCOTLAND
LONDON OFFICE: MANFIELD HOUSE 376/379 STRAND W.C.2

CARRON 'H.3' ELECTRIC COOKER

Hob structures to E.D.A. Specification • Extra large oven, thermostatically controlled • Self-indicating reciprocating switches • Easy access to fuses • Modern clean design • Strongly constructed of cast iron and sheet steel, finished in vitreous enamel. Write for full technical details and prices.

CARRON

CARRON COMPANY, CARRON, FALKIRK, SCOTLAND
Showrooms: 15 *Upper Thames St., London, E.C.4*
22-26 *Redcross St., Liverpool* 1. 125 *Buchanan St., Glasgow, C.*1

This is a CARRON product made by modern CARRON processes embodying the CARRON tradition for fine workmanship begun in 1759.

Burco

★ FOR A LONG TROUBLE-FREE LIFE

★ FOR ATTENTION TO DETAIL

★ FOR SOUND CAREFUL MANUFACTURE

This and every Burco Model is a product of years of specialisation

ALL ENQUIRIES TO

BURCO LTD.

ROSE GROVE · BURNLEY · LANCS.

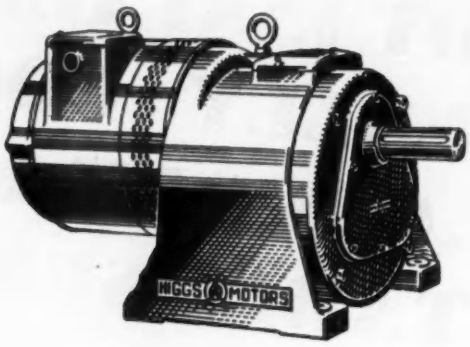
WHILE YOU'RE ABOUT IT – WHY NOT INSTALL A REALLY GOOD A.C. VOLTAGE STABILISER ?

The "Stabilistor" is entirely static and non-electronic. Sturdily constructed without any fragile parts, it provides excellent stability of output voltage, good wave-form and low output impedance. It is particularly suitable for supplying, for example, a stabilised 'ring main' round a Laboratory. Sizes range from 60 watts to 1,200 watts and frequency compensated models are available for supplying fixed loads.

Write for publication E.E.1 to Dept. E.T.4

WESTINGHOUSE BRAKE & SIGNAL CO., LTD.
82 YORK WAY, KING'S CROSS, LONDON, N.1

HIGGS MOTORS
BIRMINGHAM 6 ENGLAND



GEAR MOTOR UNITS
For slow speed drives
high efficiency, maximum reliability
and
GUARANTEED FOR EVER
(Leaflet 110)

Belfast, Birmingham, Bristol, Dundee, Glasgow, London, Manchester, Newcastle, Peterborough, Sheffield, Wolverhampton

PRECISE TIME CONTROL

C & H Process Timers are designed for use in all situations where the success of an industrial or scientific operation is dependent largely upon its accurate duration.

These instruments are available in ranges covering 0-10 seconds to 0-24 hours. Standard voltages, 110, 230 and 400.

Scale Length - - 12 inches
Accuracy - to within 0.25 per cent.

Full technical details contained in **Catalogue Section T.P.2** are available on request.

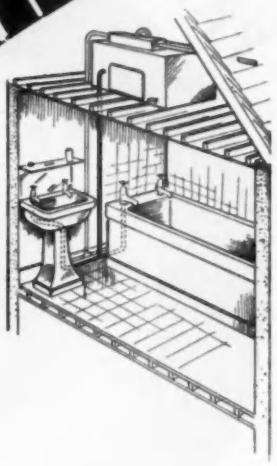
C&H TYPE "P" PROCESS TIMER

CHAMBERLAIN & HOOKHAM LTD.
BIRMINGHAM

Heatrae OF NORWICH

STRIDES AHEAD

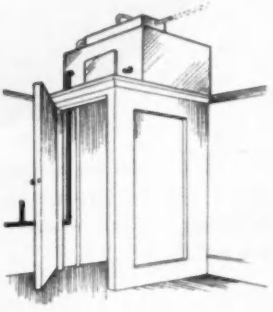
IN MEETING THE NEEDS OF THE MOMENT

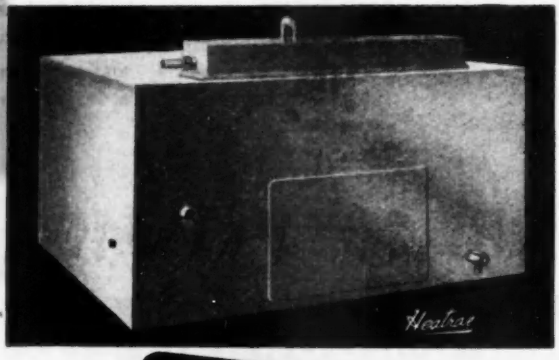


In small houses or flats where headroom is limited, this Heatrae Automatic Electric Water Heater, while occupying minimum space, gives all the advantages of a COMPLETE HOT WATER SYSTEM, with its integral ball-valve tank and hot water chamber.

There is nothing more completely efficient nor efficiently compact.

Write for our Leaflet DEh, and note its advantages.





Above is illustrated two typical applications of the Heatrae G.C.F.

(a) Heater placed in limited roof space above bathroom.

(b) Heater mounted on top of cupboard.

Heatrae **HEATRAE LTD · NORWICH · ENGLAND**

FIT MEM-AC AND DO THE JOB HANDSOMELY

The 'Mem-ac' is the best looking domestic switch-fuse you ever saw. It's not only beautifully finished but a precision job throughout. Less than half the size of most units of similar rating, it is every bit as sturdy and reliable. The double-pole slow break switch controls 60 amps. with ease. Solid silver switch contacts are visible and accessible. The cartridge fuse can be renewed in 5 seconds without tools and without exposing live contacts. And you can get prompt delivery now.

'Mem-ac' switch-fuse for single Pole and Neutral, AC only, made in 15, 30 and 60 amp. ratings. Mem-ac switches for 30 and 60 amps.

MEM

Switch, fuse and motor control gear, electric fires and localised lighting equipment

MIDLAND ELECTRIC MANUFACTURING CO. LTD., TYSELEY, BIRMINGHAM 11

A meter of excellent performance — the result of 65 years of experience combined with the use of modern materials and technique.

Introducing

F
FERRANTI

The

FERRANTI

FM METER

FERRANTI LTD Hollinwood Lancs. *London Office*. Kern House, Kingsway W.C.2

Electrically powered machines "throwing" nylons for export

Electrical power or man power?

Industry's need

Britain's factories *must* produce more—and one way of achieving this is by extending the use of electrical power and equipment. With more horse-power at their disposal, operatives in almost every industry can greatly increase their individual output.

Electricity's answer

British Electricity are getting on with the urgent task of providing our factories and homes with *all* the power they need. A great expansion programme is well under way—38 new power stations are being built and new plant is being installed in 43 existing stations.

Electricity
more power
behind production
BRITISH ELECTRICITY

C

'Perspex' Fittings for the Modern Hotel

At the Queens Hydro Hotel, Blackpool, 'Perspex' lighting fittings are installed in the dining room and cocktail bar. These fittings, made by British Thomson-Houston Co. Ltd., were chosen for their pleasing appearance, freedom from risk of breakage and good optical properties. They provide a well diffused light that shows to good advantage the attractive furnishings and decoration of this modern hotel.

'Perspex' is the registered trade name of the acrylic sheet manufactured by I.C.I.

IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1

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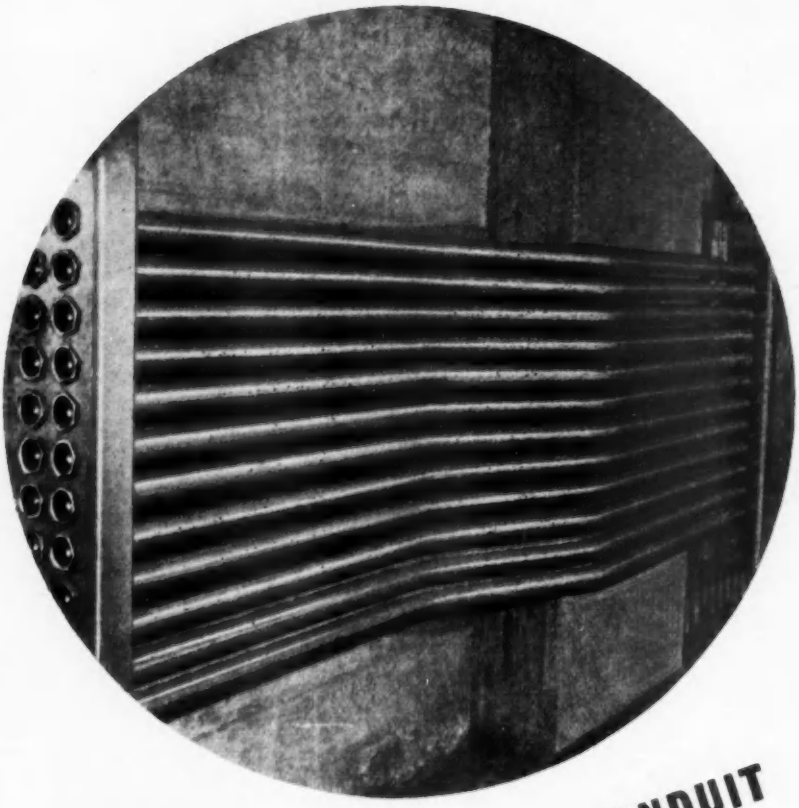
P.386

L.D.C.

LANCASHIRE DYNAMO AND CRYPTO LTD

TRAFFORD PARK, MANCHESTER, 17. · CARDIFF · WILLESDEN, LONDON, N.W.10

265 H.P. "Corcooled" motor, 1,480 r.p.m., driving a recirculating pump, in connection with the ash handling plant, at Kingston Power Station.



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ALUMINIUM CONDUIT

has many advantages in installation and service. For full information write for our new brochure.

Northern Aluminium COMPANY LIMITED

MAKERS OF NORAL SHEET, STRIP, PLATE, SECTIONS, TUBING, WIRE, FORGINGS, CASTINGS, PASTE FOR PAINT. *TECHNICAL DEVELOPMENT DIVISION:* BANBURY · OXON. *SALES OFFICES:* LONDON · BIRMINGHAM · MANCHESTER · BRISTOL · NEWCASTLE-ON-TYNE · LEEDS

ONE OF THE MANY

Backer

BOILING PLATES

The 87 BT Radiant Tubular Multi-heat type—8" diameter—3 circuit—2,000 Watt plate—built to E.D.A. Specifications.

The only plate that provides the right heat in the right place for all types of utensils and all types of cooking

SELECTIVE . RESPONSIVE . CONSTANT
RELIABLE . and . ECONOMICAL

Can be used with either a 4—5—7 or 9 heat switch

Always specify "Backer" Plates in your cooker

BACKER ELECTRIC CO. LTD., FITZWILLIAM ROAD, ROTHERHAM, YORKS.

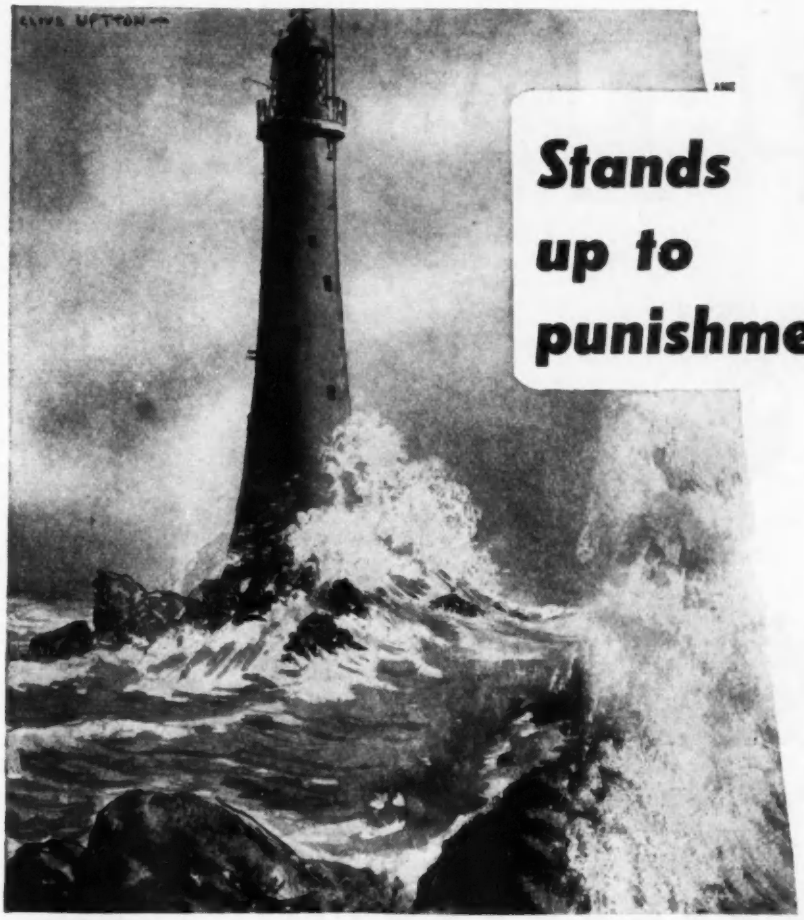
A large range of motor driven, hand wound and electrically wound types is available including Solar Dial and Sunday "Cut Out" Device when required

FULL DETAILS ON REQUEST.

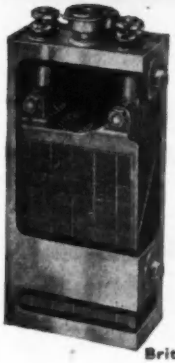
VENNER TIME SWITCHES LIMITED

Kingston By-Pass Road, New Malden, Surrey.

Telephone: Malden 2442. Telegraphic Address: Clorwiches, Phone, Malden.



Stands up to punishment

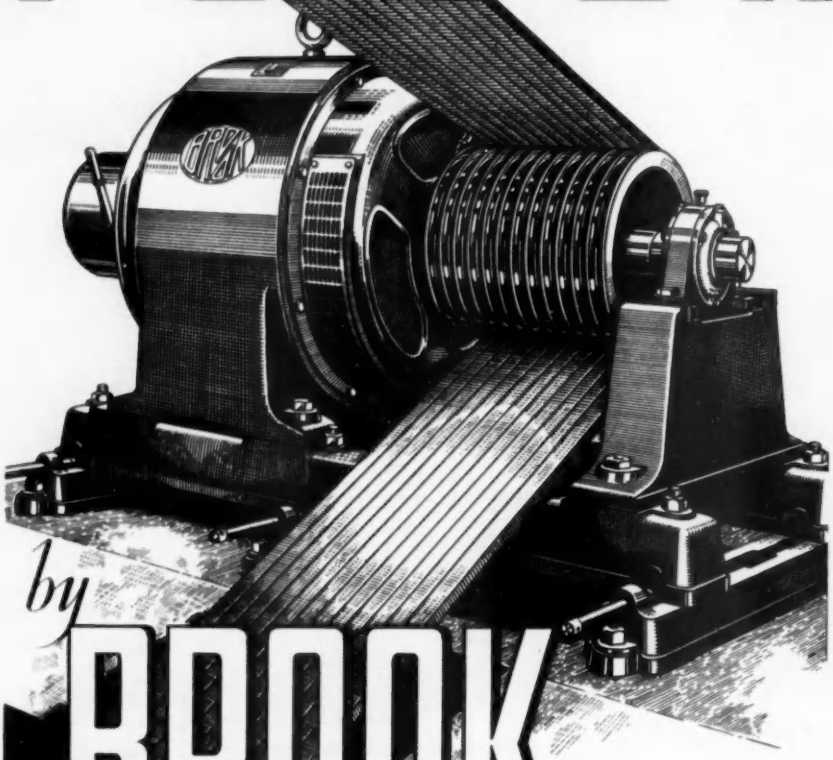


Like the lighthouse, the Alklum Steel-Alkaline Battery is built to withstand rough conditions. An all-steel welded container and sturdy plate construction ensure unvarying reliability in strenuous use. Compact, economical to maintain and quick to recuperate, Alklum is the obvious choice when unfailing reliability is essential.

ALKLUM STEEL-ALKALINE BATTERY

Britannia Batteries Limited · 66 Victoria Street, London, S.W.1. Telephone: Victoria 9661—2

POWER



by

BROOK

ELECTRIC MOTORS

BROOK MOTORS LTD • *Empress Works* • HUDDERSFIELD

NN. 67

CABLES AND COMETS

The DE HAVILLAND COMET — an epoch making production and as such demanding the finest fittings and accessories obtainable. For this reason the Comet is fitted throughout with C.M.A. cables, the last word in scientific cable construction.

MAINS CABLE MANUFACTURERS ASSOCIATION
RUBBER & THERMOPLASTIC CABLE MANUFACTURERS ASSOCIATION

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ONE FOR ALL
BASIC STOCK PANEL
Standardisation of internal fitments enables one Basic Stock Panel to be assembled for any circuit 1 to 8 .... and simple reconversion from one circuit to any other circuit ON SITE
★
1 & 2 Feeder or Transformer
3 & 4 Busbar Metering
5 to 8 Busbar Sectionalising
Range of Isolators also available
Air-Insulated
CLASS 5LA SWITCHGEAR
with oil circuit-breakers
3·3kV to 11kV up to 150 MVA
1
2
3
4
5
6
7
8
REYROLLE
HEBBURN
CO. DURHAM ENGLAND

SWITCH OVER TO Ashley

13 AMPERE FUSED PLUG & SOCKETS

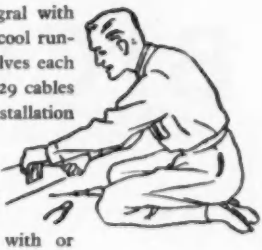
A.C. Ring Mains Circuits

—Complying with British Standards 1362 and 1363.—As recommended by Post War Building Studies. Committee No. 11, Official Report.—Sockets fit standard boxes with side cover lugs—either BS1299 or BS 1363.

Save wiring fitting and maintenance time

Made to British Standard 1363. Can be used with all appliances up to 3 kW, individual cartridge fuses being installed in each plug. The fuses are available in three sizes, 3 amp., 7 amp. or 13 amp., and comply with British Standard 1362. Should the plug fuse blow due to an appliance fault, the circuit is unaffected and the socket remains immediately available for alternative appliances.

The socket incorporates heavy self-aligning brass contacts integral with the terminals thus ensuring cool running. The terminals themselves each have capacity for three 7/.029 cables for "ring main with spur" installation as permitted by the I.E.E. regulations. Non-track mouldings and insulating screens over the contacts give inherent safety. Available with or without iron boxes to suit, colours brown or white.



DO YOU READ THE "FLASH"?

The "Flash", an informative news sheet, is sent out every month free to contractors all over the country. If you do not receive it, write today for your name to be added to our mailing list.

ASHLEY ACCESSORIES LIMITED DEPT. B,
ULVERSTON, N. LANCASHIRE
Phone: Ulverston 3333. Grams: "ROTARY" Ulverston.

The FM METER

A NEW SINGLE PHASE METER INTRODUCED BY

BICC

This meter is in production and further information concerning details and performance of the new meter will be available shortly.

B.I. Callender's

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2

ANNOUNCEMENT

WE ARE PLEASED TO ADVISE
THAT ALL LISTED

'ENGLISH ELECTRIC'

HIGH RUPTURING CAPACITY
NON-DETERIORATING

CARTRIDGE FUSE LINKS

UP TO 300 AMP RATING
(EXCEPTING TYPE 'J')

ARE NOW

AVAILABLE FROM STOCK

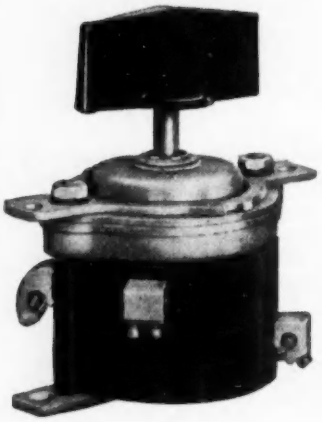
TYPE 'J' CARTRIDGE FUSE LINKS AND FUSE LINKS WITH RATINGS ABOVE 300 AMP WILL SHORTLY BE AVAILABLE FROM STOCK

THE ENGLISH ELECTRIC COMPANY LIMITED
FUSEGEAR WORKS — EAST LANCASHIRE ROAD, LIVERPOOL, 10
Works also at STAFFORD · PRESTON · RUGBY · BRADFORD

See also "English Electric" Domestic Cookers advertisement on front cover

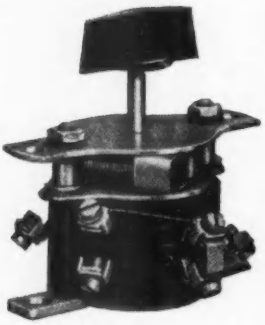
FOR SIMPLER SWITCHING...
SWITCH TO SANTON

TRADE MARK SANTON



SANTON LTD. have designed and made Rotary Switches for more than 5,000 different circuit requirements, and were the first to produce multi-circuit types in Great Britain.

Have you a switching problem? SANTON can solve it!



STURDY, COMPACT SANTON SWITCHES

- can be made to control an infinite variety of circuits.
- operate on a single rotary movement.
- have large, easily-accessible terminals, plainly marked.
- are available from 10-60 amps (180 under special conditions); any number of poles—up to six positions—up to 660 volts.
- are delivered promptly—and give years of trouble-free service.

Most areas have a Santon Resident Engineer who will be pleased to call and discuss your switching problems with you. Take the first step today towards simpler, more efficient control. Write or 'phone SANTON.

SANTON LTD

NEWPORT 16 - MON - Telephone 71211

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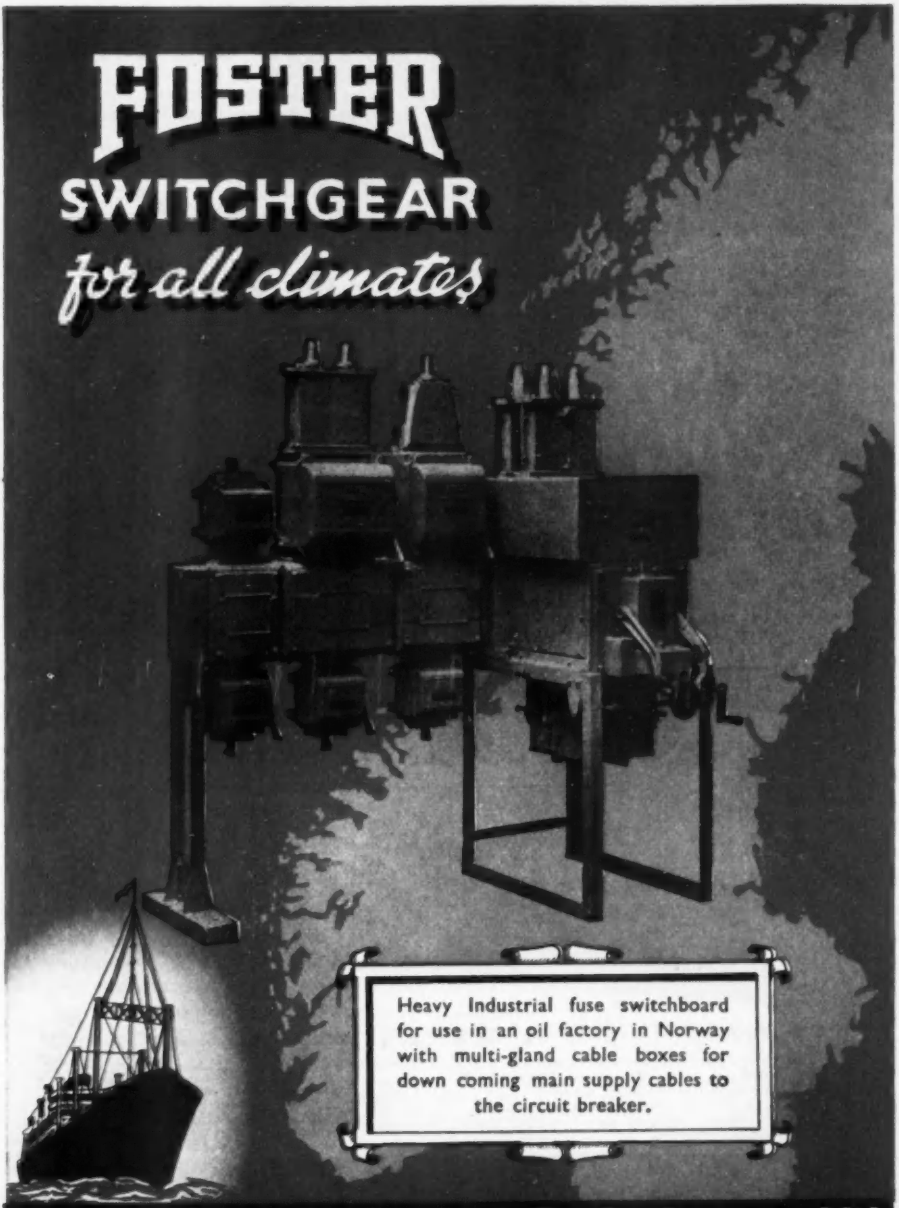
FOSTER
SWITCHGEAR
for all climates



Heavy Industrial fuse switchboard for use in an oil factory in Norway with multi-gland cable boxes for down coming main supply cables to the circuit breaker.

Foster Transformers & Switchgear Ltd

Associated with
LANCASHIRE DYNAMO & CRYPTO LTD

SOUTH WIMBLEDON, LONDON, S.W.19

Cost A LITTLE MORE *Last* A LOT LONGER

It is true that PYRAMID cost a little more than ordinary aluminium utensils, but then there never was anything quite the equal of PYRAMID aluminium ware for hotplate cooking. PYRAMID utensils are specially manufactured with quarter-inch thick bottoms; they are solid drawn in steel dies, and their thickness and quality cannot vary. They are scientifically ground by a special process to give a dead flat surface and are so constructed that distortion is avoided. Consequently, PYRAMID utensils continue to give "all over" contact with the hotplate, and so save electricity, for years after their cost has been forgotten.

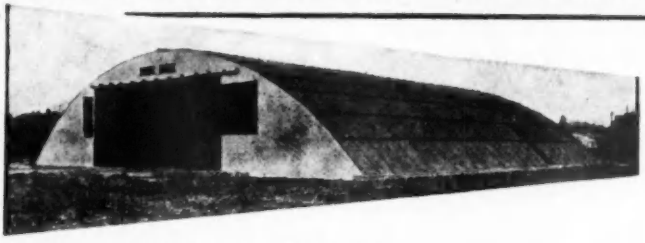
PYRAMID

ALUMINIUM WARE

HAGUE & McKENZIE LTD., PYRAMID WORKS, BIRMINGHAM 1

4026B

THORNS INDUSTRIAL BUILDINGS



SAVE TIME & MONEY

Have you considered the many ways in which Thorns Buildings can effect economies in building costs and help production to get into full swing at the earliest possible moment? If not, write for our list of buildings, suitable for Factories, Stores, Garages, Offices, Canteens, etc.

Enquiries invited for home or export.
Please write, stating your requirements.

J. THORN AND SONS LIMITED

BOX No. 41 BRAMPTON ROAD, BEXLEYHEATH, KENT

Telephone : Bexleyheath 305

BD304A

ENSURING THAT 'LITTLE MORE' IN QUALITY

in J.&P. SWITCHGEAR

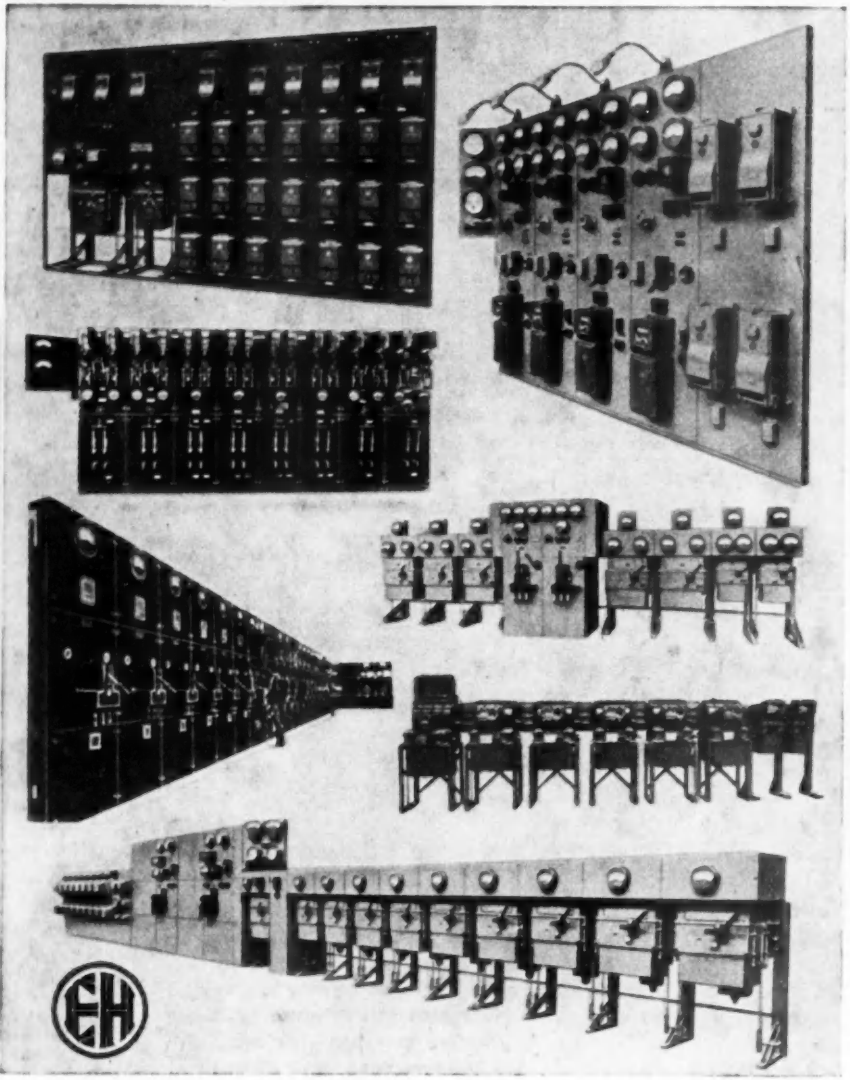
Making a Ducter Test to measure contact resistance on an SF air circuit-breaker.

No matter how conscientious the workmen, only thorough testing and continuous inspection can ensure a perfect product when dealing with equipment as intricate as switchgear. The production lines at the J. & P. switchgear factory include routine testing and inspection at every stage of manufacture and erection—routines that are strictly and relentlessly followed to ensure that every unit is as good as the one that was A.S.T.A. certified.

JOHNSON & PHILLIPS LTD.
CHARLTON LONDON S.E.7
The mark that means that "little more" in quality

D

WE SPECIALISE *in all types of* SWITCHGEAR



AC & DC SWITCHGEAR 50 Amps./5,000 Amps.

ERSKINE, HEAP & CO LTD

Head Office and Works:
BROUGHTON, MANCHESTER, 7

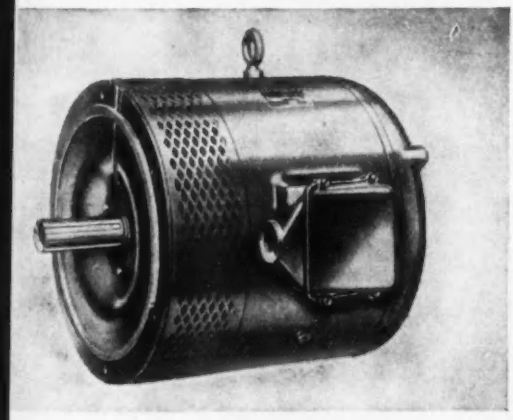
SWITCHGEAR SPECIALISTS

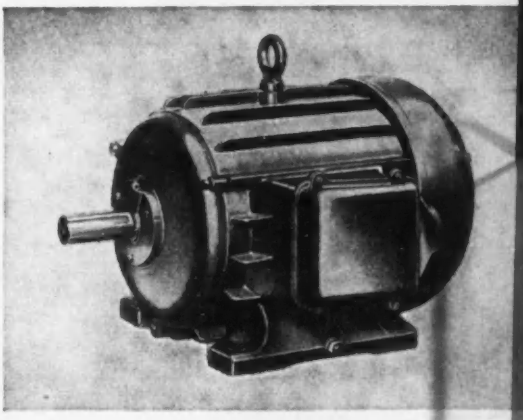
London Office: GRAND BUILDINGS
TRAFALGAR SQUARE, W.C.2.

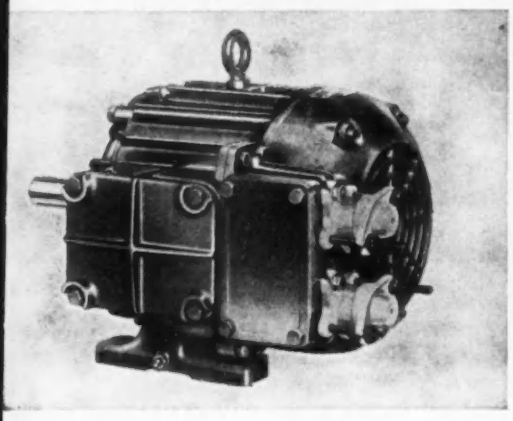
BRANCH OFFICES AND AGENCIES IN ALL PARTS OF THE WORLD

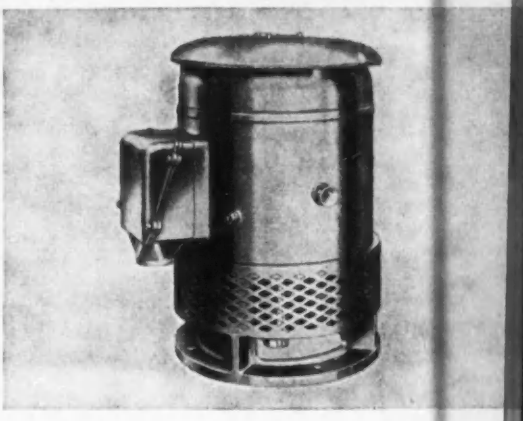
592

This way for variety









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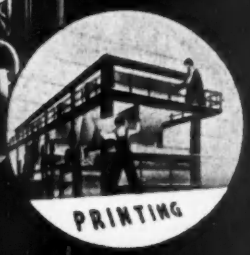

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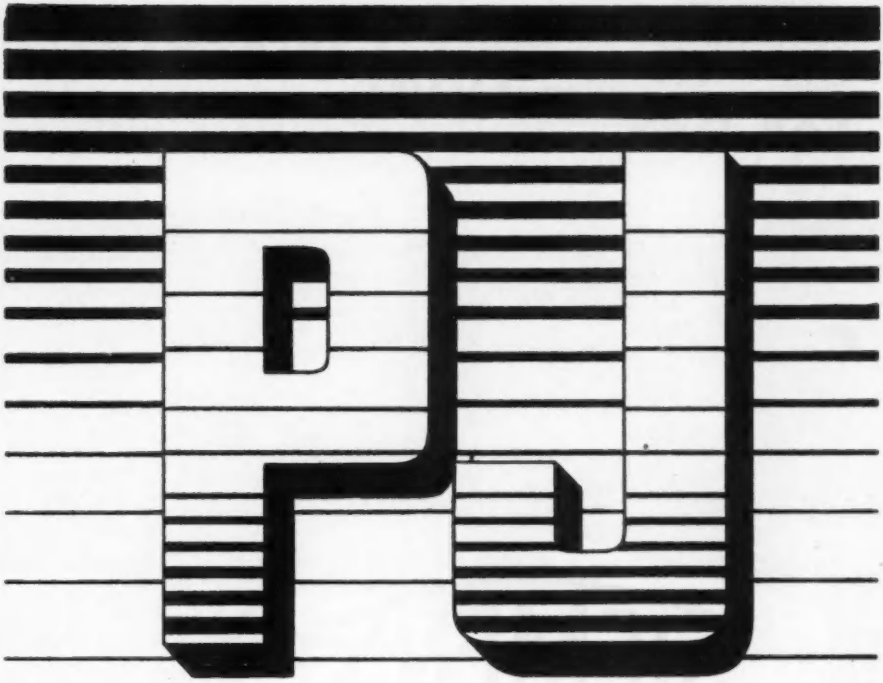

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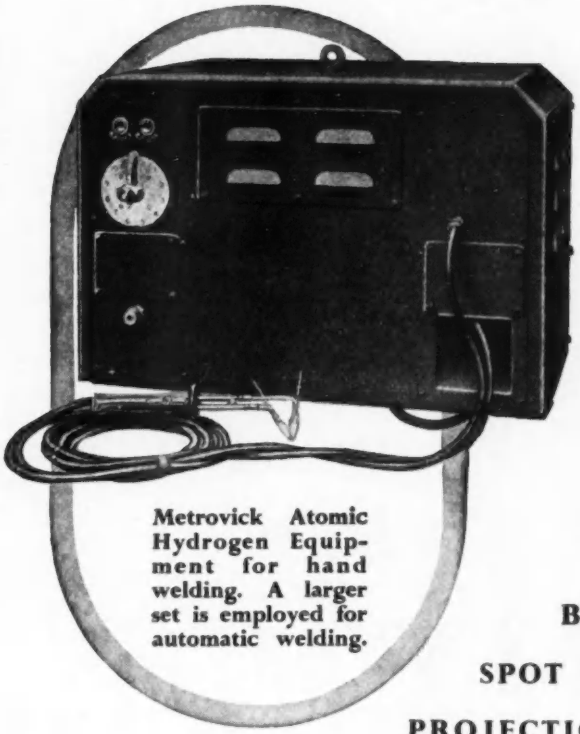

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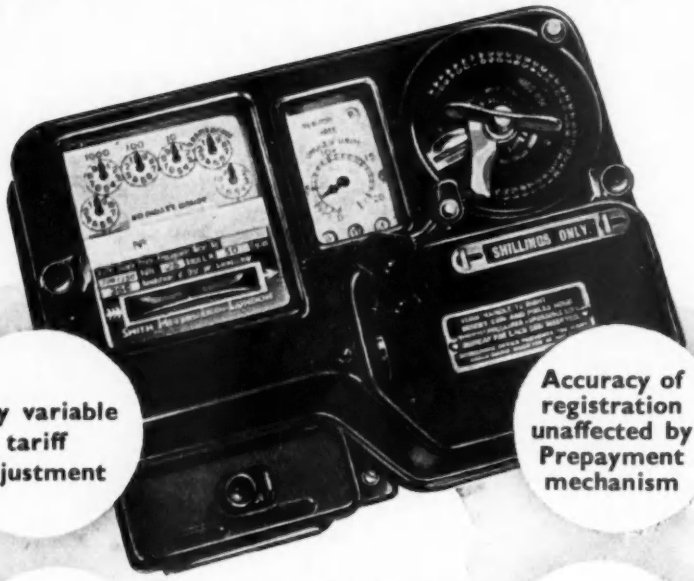

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ELECTRICAL TIMES

Vol. 117 No. 3041 THURSDAY, FEBRUARY 16, 1950

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FIFTY-NINTH YEAR OF PUBLICATION

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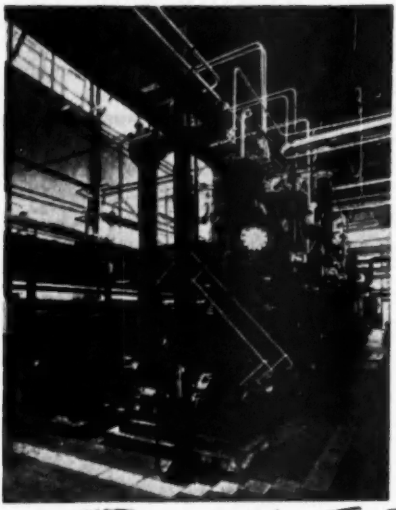

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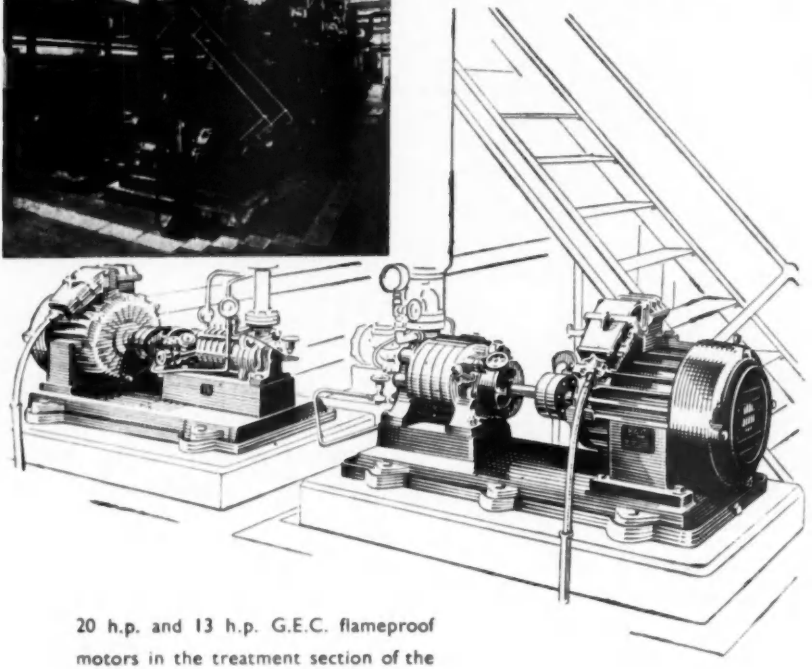
Petroleum Industry



20 h.p. and 13 h.p. G.E.C. flameproof motors in the treatment section of the refinery of Lobitos Oilfields Ltd. at Ellesmere Port, Cheshire.

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by G.E.C.

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Volume 117 No. 3041 ELECTRICAL TIMES Thursday, February 16, 1950

EDITORIAL

Prelude to Battle?

RECENT competition between gas and electricity on the Pimlico Housing Estate seems like an echo of pre-war days. As we briefly mentioned in Supply News last week, the original intention was that one-third (165 flats) should be wired for electric cookers, refrigerators and wash-boilers, the remaining two-thirds being piped for gas. This pleased neither electricity nor gas authorities and each submitted further proposals with the idea of getting their own services in all flats. The result was that the Council was able to accept both offers and have all flats supplied with both services at a price which will certainly not exceed, and probably be actually lower than, the part-gas part-electric scheme. Even nationalised industries are not philanthropists, and no one cuts installation costs without going all out for load, so that we foresee some intensive campaigning in the Pimlico Estate. Is this to be an isolated incident, or are we about to witness a return to the old-time keen rivalry between ourselves and the gas industry? We could wish for nothing better. Quite apart from its benefit to the consumer, it was the stimulus of competition with gas that helped to make this industry great, and the thrill of the chase is needed if it is to remain so.

We have heard a great deal in the last few years about a rationalised fuel policy. To force the consumer to adopt one or other service as a matter of overall national policy would, in our opinion, increase the danger of stagnation within the nationalised industries, and would be a disservice to the consumer. Providing the consumer is allowed complete freedom to adopt whichever service he prefers we do not fear the outcome.

Old King Coke

EVEN though nationalised industries may believe in healthy competition, Ministries do not, to judge from an instruction issued by the Ministry of Health to a county council in the London area. This bans both electricity and gas for water heating, save as supplementaries to solid fuel appliances. Exceptions are made in the case of old people's dwellings, one-person flatlets and, where prior approval is obtained, for converted dwellings where it is impossible to install solid fuel appliances. Passing over the illogical standpoint of the Ministry of Health in encouraging atmospheric pollution, their attitude shows a degree of interference which is, to say the least, difficult to justify. We can only assume that in barring electric water heaters, the Ministry have a vague idea that they are contributing towards the "reduction in electricity consumption" that so many ill-informed persons still consider so desirable. If so, someone should acquaint them with the facts.

Industrial Sales

BROAD-MINDED engineers view the proper utilisation of electricity as the responsibility equally of the supply authorities and of the consumer himself. Particularly is this important during the present period of plant difficulties. In the industrial field there has been a single-minded attack on adequate load spreading, and essential as this may be, it is but one aspect of the broader problem of providing industry with facilities for maximum production under present limitations on supply. This determination of optimum utilisation of electricity demands a high standard not only of electrical technology but of production practice, and men of the necessary calibre

for this work are rarely found outside the largest firms. It is in the intermediate and smaller organisations that the greater sum of opportunities exists, and here there is a definite need for advice from an outside source on the adoption of new ideas and the better utilisation of existing equipment. It is in meeting this need that area boards should be able to take the initiative. Industrial sales departments are no new feature of the supply industry, they have long existed in our large undertakings, but the time is opportune for their expansion to a level which will serve not only the needs of economical utilisation of electricity but of the nation's requirements of increased production.

A Scientist's "Trade Fair"

MORE new ground has been broken at the Science Museum with the opening of the exhibition of French scientific instruments, reported on page 253. Were this an exhibition of instruments alone, it might arouse only lukewarm enthusiasm, but the step of bringing over French scientists to discuss matters of mutual interest with their British colleagues is a bold one and reflects great credit on the eminent Frenchmen who were responsible for the organisation of the scheme. British and French scientists have long had much in common, and this exhibition gives a unique opportunity to compare methods other than by written communications, and to examine actual apparatus in place of descriptions and diagrams. Now that the ice has been broken, we should like to see the scheme extended to cover other nations, although it is realised that, since there is little or no commercial angle to such an exhibition, financial difficulties may arise. It might, however, be possible to induce the Physical Society to expand the scope of their annual exhibition to include an international section and so perpetuate this opportunity for the free interchange of ideas.

Practitioners in Vacuo

THE application of electricity to cleaning of domestic chimneys by means of the vacuum sweeping process represents as marked a progress over the conventional method as did the use of patent rods over the small boy previously employed. Such, in fact, has been its impact on the chimney sweeping trade that the personal characteristics of the sweep have changed as much as has his employment. The traditional sweep with his black face and bag of soot is as out of date as the brutal master of Tom, the chimney-boy whom Charles Kingsley immortalised in the *Water Babies*. In his place we have a white-coated practitioner who, instead of hoarsely crying his trade, discreetly displays his telephone number on the side of a neat motor-van. We feel that he will not for long remain content to be known simply as a chimney-sweep, but will form his own professional association, adopting some title more suitable to his enhanced status and emoluments. May we suggest The Institute of Precipitated Carbon Technologists? Or, more simply, the Flueological Society?

Meteor

THIS WEEK'S PHOTO

YOKER generating station, which was first commissioned in 1905, is situated in the South-West Scotland Division of the British Electricity Authority and stands on the north bank of the River Clyde just within the western boundary of the City of Glasgow. The station was previously owned by the Clyde Valley Electrical Power Co. and operated as a selected station in the Central Scotland Area under the Electricity (Supply) Act, 1926.

The present ouput capacity is 100 MW, comprising two 20 MW and two 30 MW Met.-Vickers turbo-alternators generating at 11 kV. The two small sets operate from twelve 40 k lb/hr Babcock and Wilcox boilers at a pressure of 225 lb/sq in. and 700° F, while the two 30 MW sets are fed from eight 90 k lb/hr Babcock and Wilcox boilers operating at steam pressure of 400 lb/sq in. and 800° F. Circulating water is drawn from the River Clyde. The installation of the first six boilers of the low pressure plant took place in 1922 and was later followed by an extension to the station in 1929-31 which incorporated the other six low pressure boilers and the two 20 MW machines. The high pressure part of the station, i.e. eight 90 k lb/hr boilers and two 30 MW machines, was built in 1937-39 after the removal of obsolete equipment. No plant extensions are proposed for the station at present.

For the year ending March 31, 1949, the station sent out 436,672,400 units at an average fuel consumption of 1.520 lb/u.s.o., corresponding to a thermal efficiency of 20.82%.

ELECTRICAL TIMES
POWER STATION SERIES
No 48. Yoker, Glasgow.

OUR READERS' VIEWS

Bearing Identification

Over many years' experience of maintenance of electrical motors, I have found in cases of breakdown of bearings that motors have to be dismantled before an engineer can find size and code numbers of bearings required for replacement.

This costs time in sending and getting spares. If makers of motors could incorporate size and numbers on plate for spares, or in terminal box, the engineer could have spares in stock for instant replacement, thus saving considerable time and cost.

A. H. Harris

Crayford, Kent.

The B.E.A.'s Profit

In the editorial of your issue of January 19, 1950, you state "that the B.E.A. in its first year of public ownership has made a profit of £4,000,000." As you also state that the revenue per unit (domestic) has increased by 4% to 1.445 pence per unit and that total domestic sales have brought in a revenue of £109,500,000, it will be evident that the £4,000,000 profit produced by B.E.A. has been entirely paid for by the increase in the cost to domestic consumers of 4%.

P. Adorian, M.I.E.E.

Kingston Hill.

Shift Workers' Qualifications

Your editorial states that it is a mistake to assume that shift workers are automatically debarred from attending classes. Assuming that one studies national courses to qualify for admission to the I.E.E., I would point out that many technical colleges do not cater for evening studies, and have substituted a day course (plus two evenings per week).

Day-time attendance (regular) is impossible for most of us.

It has been suggested that the five-cycle rota admits of interchange of duties to cover the necessary day attendance, but how can this be so if one's colleagues are desirous of attending the same classes?

I would suggest that, following the banning of correspondence courses, that evening courses be reinstituted at technical colleges.

I would add that many of us, young and old are willing to study for qualifications if normal facilities are afforded us.

G. C. Walker

Ipswich.

As a reader of the ELECTRICAL TIMES, I heartily endorse Mr. Thomas's letter to you of February 2, commenting on the I.E.E.'s ban on correspondence courses for the Associate membership examination. As a student of such a course and employed on shift work by the British Electricity Authority, this method of tuition is the only real satisfactory method in the circumstances.

While I myself, have been fortunate enough to attend a technical college for three years as well, I find it difficult to keep up with the progress of lectures due to having to miss one complete set of classes every few weeks.

It is therefore obvious that the correspondence course is the only efficient method for shift workers, especially those employed by the B.E.A., to obtain the necessary technical qualifications for promotion. Especially as the B.E.A. lay particular emphasis on technical qualifications.

D. Corfield

Wolverhampton.

I notice a reference to classes for shift workers in the current issue of the ELECTRICAL TIMES.

It may interest you to know that when I was head of the electrical engineering department at a London technical college, it was our standard practice to provide instruction during the day or evening to suit shift workers, especially those from the supply industry. Quite a number of my students gained both Ordinary and Higher National Certificate in this way.

A. M. Parkinson
Principal,
Newton Heath Technical School,
Manchester.

PERMANENT MAGNETS

Production Techniques using Pure Iron Powder

By B. M. PEARSON

POWDER metallurgy always becomes specially interesting when its products show properties which cannot be reproduced by any other mode of manufacture. Unusual characteristics often are obtained by a combination of materials which cannot be used together or combined in any other way than by a mixture of the powders.

A few years ago, however, some unique properties were found in a powder metallurgical product of a single metal—properties which were completely different from those of the solid material and which were limited to powders below a certain critical particle size[1].

Pure Iron Magnets

It was discovered that if iron powder, of a sufficiently small particle size, were compressed, the resulting compact had excellent permanent magnetic properties, comparable with the best permanent magnetic materials obtained by standard alloying procedures. The particles had to be of colloidal size, that is, of a size between 1/10 and 1/5 micron or smaller, and during the process of manufacture, temperatures and pressures had to be avoided which would make the particles agglomerate or the grains grow.

Magnets of this type have been produced since about 1946 by the French company, Societe d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electriques d'Ugine, in Grenoble, France, and a large amount of theoretical work has been done at the University of Grenoble, especially by Prof. Neel.[2,3] It had already been discovered previously that the coercive force of powdered material depended on the particle size, at least, to some extent, and a number of papers had been published concerning this.

The U.S. patent of Dean and Davis[4] mentions the production of fine iron powder, and its use for permanent magnet material. Guillaud[5] in his doctor's thesis, 1943, described the dependence of the coercive force of an inter-metallic compound MnBi, on particle size; and Kittel[6] published a theoretical paper in 1946, determining the maximum size of ferromagnetic powders which would still form "single domain" particles and therefore have permanent magnetic properties.

It was at first quite surprising to obtain permanent magnetic material from pure iron, which, in the cast and rolled state, is generally the ideal material for the opposite purpose; that is, it is magnetically soft. The theoretical explanation for this fact has been brought forward, especially by Neel[2,3] and Weil[7] in Grenoble, and by Stoner and Wohlfarth[8] in Leeds, who followed to some extent the fundamental ideas advanced by Kersten.[9] The effect is now fairly well understood, and it is known that, below a critical particle size, the particle shape is also of special importance to obtain permanent magnetic properties. Actually, it was found that magnetic measurements could be used to determine the size and shape of ferro-magnetic inclusions in non-magnetic materials (for example, ferrite inclusions in austenite) following the theory developed for these fine iron powders.

The only manufacturer known who is producing permanent magnets from ultra-fine iron powders in fairly large commercial quantities is the Societe d'Ugine in Grenoble. Other companies, some of them in America, are using fine powders for magnetic recording tape, but so far as is known, no publication has appeared, on the production of either the magnetic material, or the powder. The Ugine company has obtained a number of patents [10,11,12] covering the production of the iron powder, as well as the magnets themselves.

Although any iron powder of a suitable particle size can be used for the production of magnets, the company prefers to use powder made by the decomposition and reduction of certain iron salts. It is known, however, that extremely fine iron carbonyl powder and so-called Raney iron (which is usually used as catalytic material) is also usable.

Production of the Powder

The Ugine company produces its powder by the decomposition and reduction of iron formates. Iron formate is made by dissolving scrap iron in formic acid at an elevated temperature and precipitating the formate during cooling. Both temperature and concentration have to be carefully controlled in order to

obtain the correct particle size of the formate. In the second step, the formate is decomposed and reduced under hydrogen in special furnaces, at a comparatively low temperature, not exceeding 400° C.

The products of decomposition and reduction have to be removed carefully, in order to bring the reactions to completion. A higher temperature would cause the very fine powder to agglomerate and therefore it would lose the effect peculiar to it. After reduction, the powder is extremely pyrophoric, so that it cannot be removed from the furnace without protection. It has to be covered with a liquid, such as benzene, ether or acetone, within the cooling chamber of the furnace. The wet powder is removed from the furnace and pressed wet in hydraulic presses with about 30-50 tons/sq in. pressure. Much higher pressures would destroy the good permanent magnetic qualities.[13]

Machining and Forming

The pressed magnets are either covered with oil to prevent any burning in air or immediately immersed in some organic or inorganic binding material which solidifies afterwards and also increases their coherence and prevents any possibility of oxidation. After this, the magnet is finished, ready for magnetisation and use. Quite complicated shapes of magnets are obtainable, and holes can be pressed into the magnet. It is even possible to press the powder around inserts, which serve as shafts or holders of the magnets. The pressing can be done to very high accuracy, so that no further machining is necessary to obtain the required tolerances. The application of pole shoes is difficult, but is often not necessary because complicated shapes can be produced directly by pressing. The magnetic properties of the magnets are very good, as shown in the diagram.

The Ugine company produces two kinds of magnet: one made of pure iron and one containing 30-35% Co, which is added during production of the formate. The magnetic properties of the cobalt containing material are somewhat better, but the use of so much cobalt as alloying ingredient is expensive and often not justified. The magnetic properties compare well with the average grades of Alnico and can be slightly varied by changing production procedures to correspond closely with one or the other of the Alnico grades.

The magnets are quite weak mechanically, and, at the present time, this limits the field of their application. It is possible to improve the mechanical strength about four or five times, by a heat treatment between 300° and 450° C.,[14] which, however, slightly decreases the coercive force and increases the residual magnetism, without changing the energy value. Temperatures above 700° C. destroy the permanent magnetic properties.[13] By the use of better infiltrating and binding materials, it will undoubtedly be possible to improve the mechanical strength for future applications.

It is interesting to note that the production method used for this fine iron powder is applicable to other metals, as well as certain alloys, such as tungsten-copper or iron-nickel-copper, for use in other fields.[15]

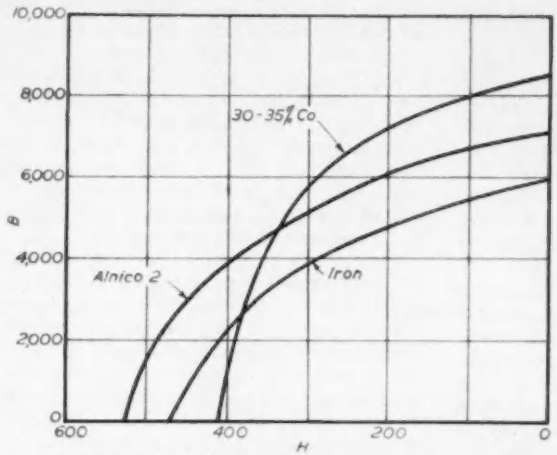
These extremely fine powders promise interesting results in future work. Problems, such as minimum particle size obtainable and its effect on the mechanical properties of compacts, as well as low-temperature sintering procedures, which retain most of the particles in the small size, will have to be solved theoretically as well as experimentally. There is no doubt that new properties will be discovered if these powders are more readily available and if their behaviour is better understood. The production of permanent magnetic materials from fine iron powders is actually only the first step in the development of a new branch of metallurgy.

Precipitation Mechanism

For some years, many metallurgists have believed that the age-hardening mechanism in permanent magnet alloys consisted simply of precipitation by nucleation and growth, in which the precipitation occurred by the usual Widmanstaetten mechanism, and during the early stages of which the precipitate was coherent with the matrix.

Dr. Geisler has succeeded in proving that mechanism for several alloys.[16] The interpretation of streaks in Laue photograms, represents a specialised but important part of the precipitation problem. It has been demonstrated that the streaks can be interpreted generally as the result of the small dimensions of the precipitate particles, and that they have a new structure related to the matrix by coherency. As such, the small particles should warrant no special consideration as a step in the precipitation process discrete from the larger, coherent particles, that produce normal, sharp diffraction. This was suggested some 8 or 10 years ago and has since been confirmed for several alloys. The present study shows that age hardening need not be contingent upon the structure that is responsible for streaks, since the major part of the hardening of Cunico occurs after the particles have grown to a size large enough to produce sharp diffraction.

This ageing is a little different from the



Magnetisation curves for pure iron and pure iron-cobalt powder magnets, compared with Alnico 2

normal precipitation process. Constitutionally, it is almost a eutectoid reaction. The difference between the precipitation process in the Cunico type alloy and the usual type is that here the precipitate has the same structure as the matrix, whereas usually the precipitate has a structure different from the matrix. In this respect, the reaction here is more remote from the eutectoid reaction than where both decomposition products usually have structures different from each other and different from the parent phase. Furthermore, the basic constitutional difference exists: that of the absence of a specific reaction temperature and composition, as in the eutectoid reaction. Grain refinement in some alloys can be induced by the nodular reaction: the best evidence for this has been obtained on single crystals using the Laue X-ray diffraction technique.

It is suggested that in the case of certain precipitation hardening alloys, it has been found possible to obtain grain refinement of the solid solution by means of a process involving precipitation, followed by re-solution. Presumably, precipitation of the discontinuous "lamellar" type in the region of the grain boundaries of the solid solution is attended by recrystallisation of the matrix. Upon re-solution, it is probable that the new orientations of the previously lamellar patches are preserved, thus effecting grain refinement of the solid solution.

The application of the nodular reaction as a grain refinement method depends upon both alloy and thermal treatment. Since this is a recrystallisation of the matrix, it can be suppressed by the relieving of strain through prior recovery, in much the same manner as the suppression of recrystallisation of cold worked metal. Thus, by slow heating to the solution temperature, it has been possible to recover single crystals by reabsorbing the recrystallised nodules. For grain refinement, such a reversion would have to be prevented; the nodular reaction would have to be carried to a sufficient degree of conclusion by ageing, and the heating rate to the solution temperature would have to be sufficiently fast to avoid reversion to the original grain structure. Naturally, if the rate of grain growth to a stable structure is very rapid at the solution heat-treating temperature, as it may well be in some alloys, this method would be of little avail as a possible method of grain refinement.

Alloys for Permanent Magnets

The development of alloys for permanent magnets provides an interesting study in metallurgy.[7] Theory indicates that to obtain a coercive field as large as possible, it is necessary that the material should possess internal tensions as large as possible, irregularly distributed, while at the same time the micro-inclusions are occupying a large relative volume.

Magnets made from pure iron powder can be considered as coming within the general case; the procedures employed in the manufacture of these sintered iron powder products can be considered as a synthetic method of obtaining holes, but the same results are obtained almost automatically in the case of those alloys which harden by precipitation, in which a solid, homogeneous solution at high temperature decomposes on cooling into two distinct phases.

For example, in the nickel-beryllium alloy, the beryllium which is soluble at a high temperature separates at a low temperature. One then obtains grains of beryllium isolated in a matrix formed of a solution of beryllium in nickel. These grains serve the role of inclusions, while at the same time promoting the formation of internal tensions. In the same way, in the iron-nickel alloy of the Fe_2NiAl type, the solid solution which is formed at a high temperature of atoms distributed at hazard according to the different positions of the lattice, decomposes at a low temperature into two distinct phases,

belonging to the same crystalline lattice, but which are very different as regards composition.

One of these phases, constituted by almost pure iron, is very magnetic; the other, which contains practically all the nickel and the aluminium, is much less magnetic and behaves as an inclusion with respect to the first phase. By rapid cooling, it is possible to obtain very fine grains which become larger on reheating; it is consequently possible to obtain the most favourable electrical properties by means of suitable heat treatment.

These alloys of iron-nickel-aluminium with the addition of cobalt, vanadium, etc., constitute excellent magnets. When treated thermally in a magnetic field, they become anisotropic for a certain composition and present, in the direction of the magnetic field that has been applied during cooling, a high permanent magnetism. This phenomenon is probably due to the elongation of one of the phases under the influence of the internal magnetising field. This effect will be all the more easy to produce if the interfacial tension of the two phases is lower and at the Curie point is higher, a fact which permits of working within a temperature range sufficiently high for the recrystallisation to be rapid. There is also embodied here the principle of a method of research and measurement of interfacial tensions in the solid state.

Machining Problems

Arising from their method of preparation, all these magnet alloys are very hard and very difficult to machine. It is equally possible to obtain the dispersal of inclusions on the scale desired by making recourse to the alloys such as the iron-cobalt-vanadium type characterised by the existence of a certain unique gamma phase, stable at high temperature, and of another unique alpha phase, stable at low temperature; these two domains of temperature being separated by an intermediate region, inside which these two phases, alpha and gamma, can co-exist in equilibrium. When a rapid cooling effect is applied to this type of alloy, this intermediate temperature region is traversed sufficiently quickly, so that the separation into the two phases (whose compositions are, in addition, slightly different) cannot be affected, for the atoms of the different constituents have not the material time to diffuse for a long distance.

It results from this that at a low temperature the alpha phase is obtained in the pure condition. As a corollary, the mechanical hardness is low enough for the alloy to be easy to machine. If the alloy is then reheated, in such a way as to bring it back into the intermediate temperature region, while also allowing it to remain for a sufficiently long time at this temperature, the phases then separate into distinct grains, which it is possible subsequently to conserve in a false equilibrium at ordinary temperatures by rapid cooling. Alloys of this type, containing 50% of cobalt, and 10% of vanadium, that have been developed by Nesbitt, are being used in the United States under the name of Vicalloys.

Some examples presented in the technical literature, chosen from among others, serve to show sufficiently the importance of the nature of the information that is furnished by a study of the magnetic properties of an alloy, of which one at least of the phases is ferro-magnetic. As regards the practical application of the magnetic alloys, one cannot stress too highly the importance of the more profound and vigorous modern theories of hysteresis.

Very happily, from the point of view of the magnet manufacturer, as well as that of the manufacturer of transformer and dynamo sheet, with a reasonably low loss, in order to develop these alloys, it has not been necessary to wait for an understanding of the mechanism of magnetism and theories that are developed on this basis. But it is necessary to say, also, that efforts that have been expended in the empirical study of the phenomena have been incomparably greater than those that have been devoted to their interpretation. In a field of work as complex as that of metallurgy, it would be quite reasonable to expect at least that, armed with a better comprehension of the phenomena involved, a notable economy in time and in operations would be possible; even if this were only of the order of 20% it would still be a very important achievement.

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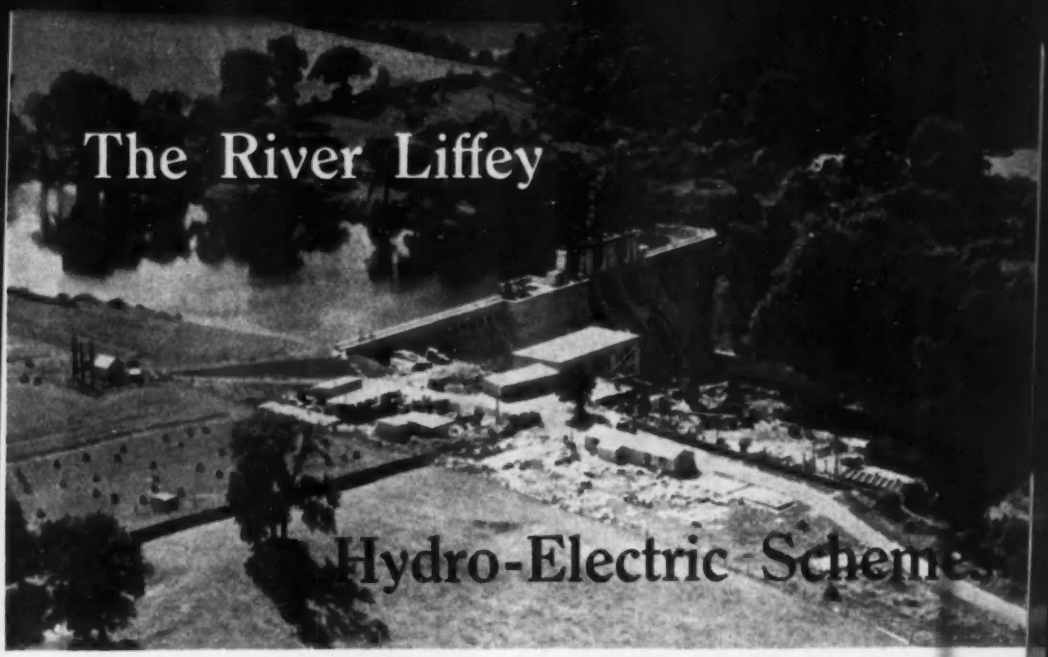


The River Liffey

Hydro-Electric Schemes

DEVELOPMENT of the hydro-electric power resources of the River Liffey began originally in 1937, eight years after the Shannon hydro-electric station had started operation. Unlike the Shannon, which is a slow-running river, with a comparatively small drop, the Liffey has a considerable available head. It rises in the Dublin mountains at a height of nearly 1,800 feet above sea level, and takes a circuitous route, west over the plain of Kildare, then turns north and finally east to enter the sea at Dublin Bay. The length of the river is 82 miles, and the catchment area amounts to some 500 square miles. There are a number of falls in the river, and of these the three most suitable for power development are located at Pollaphuca Bridge—where the main road from Dublin crosses the river—at Golden Falls, about a mile downstream from Pollaphuca, and at the Salmon Falls near Leixlip.

Pollaphuca

Initial construction at Pollaphuca began in 1936. A 100 ft. dam was built across a rocky gorge giving an available head of 150 ft. and also creating a reservoir with an area of 5,000 acres, 600 ft. above sea level. This is used as an additional water supply to the city of Dublin. From the dam an intake tunnel about a quarter of a mile long leads the water from the reservoir to a 120 ft. high surge tank overlooking the station. From the surge tank it descends through 200 ft. long penstocks to the two 15,000 kW Kaplan turbine sets installed in the power house below. The first of these began operating in 1944 and today both sets are in commission. The power generated is transmitted at 110 kV to Inchicore, and then into the general transmission network. For the last two years the output has been at the rate of 30 million units/annum, generally for peak load use.

Golden Falls

One mile down the river from Pollaphuca is the Golden Falls station, and the stretch of water between the two stations is used as a compensation reservoir for the purpose of equalising the flow in the lower river when the first station is in full operation. Sufficient capacity is available in this section to contain the water required for 3½ hours running at full load from Pollaphuca. This water is then released evenly through a 24-hour flow off. The dam at Golden Falls gives a 60 ft. head of water to drive a 5,730 h.p. turbine coupled to a 4,000 kW generator. At present a small staff is engaged in running this station, but arrangements have been made to run it by remote control from Pollaphuca.

The Leixlip Power Station

Most recent of the three stations is that at Leixlip where the river has a fall of 60 ft at Salmon Falls. The station was completed in July, 1949, and the dam gives an artificial lake two miles long on the upstream side covering an area of about 100 acres and with a storage capacity of about 160 million gallons. The water enters the turbine through a steel-lined duct, 10 ft 6 in. dia., built into the dam. A quick-closing sluice at the intake at the dam is electrically connected to the turbine protection system.

The turbine-alternator itself consists of a 5,800 h.p. Kaplan machine by Escher Wyss driving a Brown-Boveri alternator rated at

5,150 kVA, 4,000 kW. The speed is 300 r.p.m. and the gross design head 57·4 ft. The set is operated by remote control from the transformer station at Inchicore, and is completely automatic.

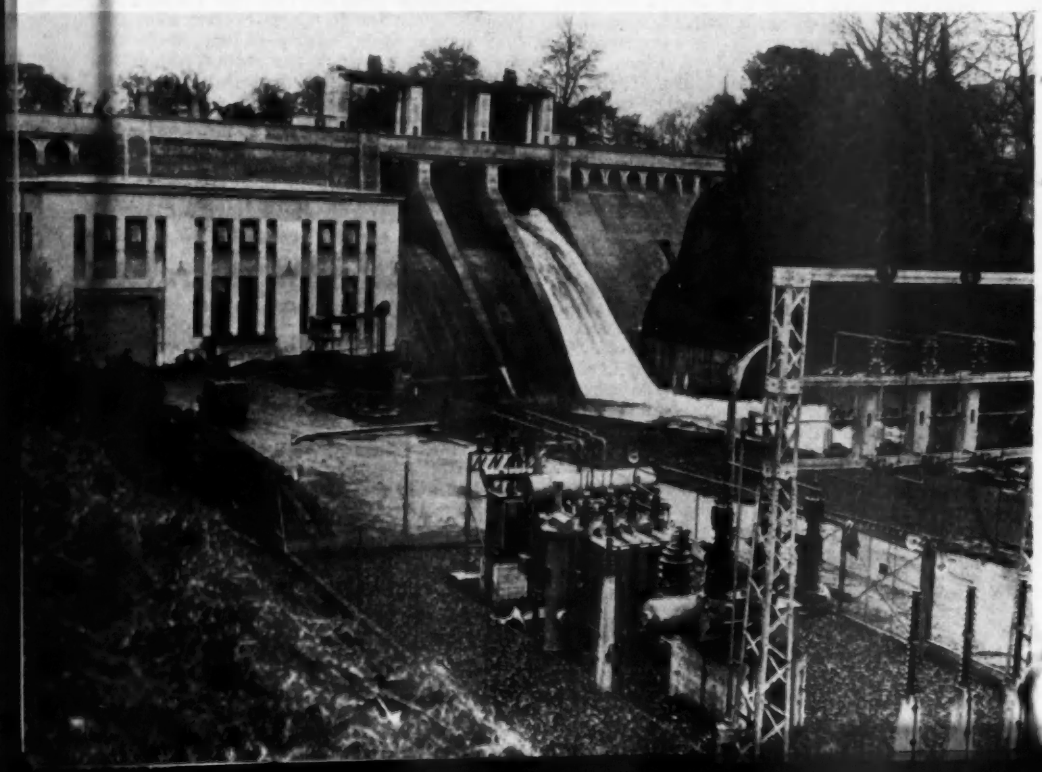
The diameter, over blade tips, of the five-bladed turbine runner is 6 ft 6 in., the runner blades and runner chamber being made of stainless steel.

Generation is at 10/11 kV, the transmission voltage to Inchicore being 38 kV. All transformers, switchgear and control equipment were supplied by Brown-Boveri. The 38 kV circuit breaker (outdoor) and the generator 10 kV breaker are the air blast type. An unusual feature is that the instrument voltage transformers are compressed air filled instead of being the usual oil-filled or air-insulated types.

Another interesting feature is that instead of the generating unit being controlled by the normal mechanical governor, the turbine speed is controlled by a Brown-Boveri electric frequency regulator, actuated from a voltage transformer. Apart from this frequency regulator, the governing equipment was supplied by Escher Wyss.

An unusual type of fish pass has been built into the dam. High on the upstream face of the dam is an open chamber connected by an enclosed sloping shaft to another chamber in the base at the back of the dam. At regular intervals the chambers and connecting shaft are flooded and emptied by automatically operated sluice gates. The fish, attracted by the out-flowing water, swim into the lower chamber, pass up through the connecting shaft into the top chamber, from which they are released into the head waters.

The 4,000 kW Brown-Boveri alternator



Leixlip station showing substation in foreground

PROBLEMS and PRACTICE

In Engineering

Another Cable Solution

FURTHER to the query appearing in Problems and Practice of the October 20 issue, and its comments and solutions, the following suggestion is submitted:—

The essence of this problem is that the fault resistance is changing, thus the suggested application of Murray loop test is not practical. The solution given by I.A.V. although sound in that it takes care of the time factor, is, however, liable to some error due to contact resistance of double pole switch.

Now if the principle of the Thomson Double Bridge be used a more reliable balance is obtained.

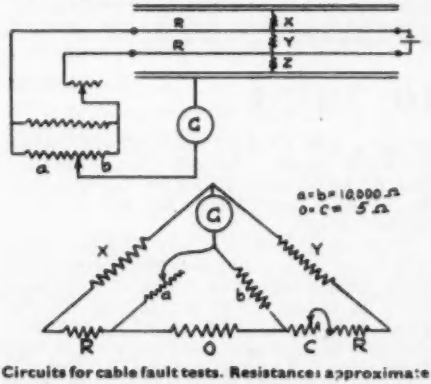
In the lower sketch with bridge balanced

$$\frac{X}{Y}=\frac{a}{b}=\frac{R}{R+c}$$

hence

$$R=\frac{ac}{b-a}$$

(as given by I.A.V.), with the advantage that only one balance is required.



Circuits for cable fault tests. Resistances approximate

In the event of X and Y being nearly equal, the fault resistances to be used could be X and Z, the equation being

$$\frac{a}{b}=\frac{R}{KR+C}$$

Where K is the ratio between core and sheath resistances. This latter equation is only approxmate due to possible non-uniform effective sheath resistance.—*J. F. B.*

An Unusual Fault

A D.C. 250 volt 3 b.h.p. motor had a partial armature rewind. Following the usual practice, a drop bar to bar test was applied to the commutator and all was in order. When connected up to the supply the torque was exceedingly poor, and the speed well below normal. The machine was switched off and a voltmeter test across the supply indicated practically normal voltage. A static bar to bar drop test may, in some cases, be deceptive, as faults may develop on rotation. In this case, however, an absence of sparking indicated no open circuits and the absence of local heating of the armature coils ruled out shorts in the windings or comm. bars.

Suspicion was now directed to the shunt field which was of the two-pole type. A voltage drop test was applied to each field coil in turn from a 250 V circuit. Each coil gave an even reading but instead of 125 volts per coil, the instrument read 115 volts per coil. This meant that 20 volts were unaccounted for. Obviously the trouble was in the external circuit—some high resistance caused by a bad contact somewhere. A 1 kW radiator was connected up in place of the motor and a voltmeter across the supply. Prior to switching on the radiator, normal voltage indicated, but when the heater was put on, the voltmeter read approximately 160 volts. Investigation revealed that, due to a fault, the neutral had open circuited but was making a partial contact with earth, thereby introducing resistance in the external circuit. Naturally, the open circuit voltage test with a resistance of thirty or forty ohms made no appreciative difference to the reading of an instrument with an internal resistance of anything from 20,000 to 50,000 ohms.—*F. Mackintosh.*

Regular Inspection Needed

THAT periodical inspection of installations are necessary cannot be emphasised too much; an example of what can happen through neglect is given below.

Assistants in a shop were receiving shocks from a conduit. Upon investigation this conduit was found to be feeding the meters from a remote service three shops away, running through the basements. After further enquiry, it was found that these basements had been used as an air-raid shelter during the war years. In the one basement, a main water pipe had been removed for "safety" and, from remnants of earth wire, still to be seen, this had served as the main earth for the conduit and installations.

Tracing this conduit, it was found that it touched another conduit in the first basement by the service. This conduit was feeding lighting and power in the shop and dwelling quarters above.

Isolating the conduits, it was found that the conduit from which the shock was being obtained was clear, but the conduit touching it was "live."

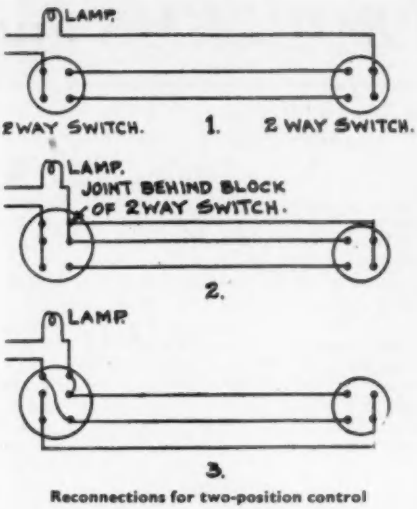
The installation in these premises was wired in twin lead from the distribution boards, and upon testing and tracing each circuit, it was found that a nail had punctured the sheathing and was touching the "live" lead under the attic floor. The lead sheathing throughout the installation was bonded to the conduit which, in turn, was touching the "feeder" conduit supplying the premises three shops away. The fault was rectified with a metal junction box, conduits earthed, tested and all left in good condition.—*R. S. M., Great Barr.*

Two-way Switch Conversions

THE normal method of wiring for the control of one lighting point by two two-way switches is shown in Fig. 1 on the right.

It is often required to extend from one single-way switch control to two two-way switch control and conforming to standard practice, this necessitates fitting a porcelain connector to the wiring or jointing a cable at the back of the switch block or in the box behind the switch depending upon the type of wiring installation. See Fig. 2.

A means of eliminating this joint is indicated in Fig. 3 in which two two-way switches can be included in a circuit extended from an original single-way switch control. It will be seen from the wiring diagram that it is only necessary to use the terminals of the switches without any connector behind the block.—*J. W. C.*



Reconnections for two-position control

Contributions to this feature dealing with specific problems and items of interest to practical engineers are welcome, and will be paid for at our standard rates. Items should be brief, and preferably accompanied by diagrams or sketches, which will be redrawn for publication.

Contributors should state whether or not their names are to be published if their notes are accepted.

FREEDOM TO THINK

FREEDOM for workers in research associations to pursue "hunches," rather than always be tied to programmes, was suggested as a possible improvement to the E.R.A. routine by Sir Laurence Bragg when he proposed the toast of the Association at the luncheon held after the 29th A.G.M. last Friday. He maintained that recognition of the importance of research was not enough in itself, and he suggested that those in high places were in danger of forgetting some of the things history had taught. One of these was the danger of thinking that things were so because some people had stated this as a fact, and the other was that, if you want new knowledge, you must forget, as you search for it, what application that knowledge is to have. Science is the seed from which next year's crop will come; technology the harvest of this year's crop.

Much could be done by the type of research committee run by the E.R.A., but the freedom spoken of above could produce results disproportionately valuable. He was sure that such facilities would not be wasted.

Lord Citrine, this year's President of the E.R.A., replied to the toast, and recalled that two years ago he had spoken at the luncheon as principal guest. Then nationalisation of the supply industry was a few weeks away, and he had felt it necessary to allay prevalent uncertainty with an assurance that the Central Authority would continue the cooperation that the Association had always received. Now he thought that cooperation was again an established fact.

Research he considered very largely an act of faith based upon a long progress of events, but many developments were continually emerging from its pursuit. The B.E.A. had its own Research Council, which tackled its particular problems of obtaining more energy/lb of coal, more plant/£ of expenditure and of conserving manpower. It could conduct research in power stations, and for this reason collective research should lie more in the primary electrical field than in generation problems.

Leatherhead

The E.R.A. had very good organisation and direction, a modest income and a quite insufficient amount of accommodation. The plans for a move from Perivale to Leatherhead had been under consideration since 1944; £600,000 was now considered necessary to finance the scheme, though some considered this an excessive sum. Whatever the end might be, however, he did ask that a decisive step in the matter would be taken in his year of presidency, so as to prevent the stagnation of the Association.

Cooperative Electrical Research

E.R.A. reports progress in 29th year

NEW articles of association were made necessary for the Electrical Research Association by the results of the 1947 Electricity Act, which changed the conditions of electrical supply authority representation. The recently issued annual report, covering the period from October, 1948, to September, 1949, is the first issued under the new articles, and thus has a special interest.

The size of the Council of the Association has been increased to 31, but the numerical relationship between supply authorities and manufacturers remains as it was before revision. Six members are allotted to the B.E.A., the Area Boards as a group, and to B.E.A.M.A.; the other representatives come mainly from D.S.I.R., the C.M.A., I.E.E. and G.P.O., the British Transport Commission and the North of Scotland H.E. Board.

Income for the year, under a modified subscription rate, amounted to £205,388, a sum which included £112,232 from members and associates and £70,000 from D.S.I.R. Over half of this total was spent directly on research by the Association, and a further £24,260 was expended on extra-mural research. Office expenditure totalled £35,631.

Research

The greater part of the report discusses the many investigations which were actively carried out in the year under review. First comes work on insulation and dielectrics, much of which is of a fundamental nature and is centred at various British universities. More immediate practical importance attaches to the analysis of replies received to a questionnaire about tracking occurrences in service and in the building up of data on the brittleness of filling compounds, and their resistance to insulating oils. Reports of the occurrence of high grade electrical mica in Central Australia are being followed up, the material available being subjected to detailed examination.

Rates of rise of restriking voltage and circuit severity criteria continue to attract the attention of the switch and control gear section. Work on contactor research has been resumed after a lengthy interruption, and attention is being directed to contact wear, making and breaking capacities and temperature rise. This development has rather slowed down the various fuse researches, which have also been affected by the need for equipment servicing.

Turning to generation, the Report notes the continuation of investigations on the temperature-pressure-volume-heat relationship for steam. This work, which is being conducted at the Imperial College of Science and Technology, aims at extending available steam tables up to 6,000 lb/sq in. and 1,400° F. Elsewhere, investigations are going forward into the various problems associated with the use of steel at about 1,100° F, and also into the effect of swiftly moving sea water on condenser tubes. Progress is being made on the project for using wind power for electrical generation, and this has been widely reported.

Cable characteristics when subjected to short circuit currents have been investigated, and the limits imposed by earth fault currents are now being looked into. With respect to normal operation, the determination of cable ratings and soil resistivity by the use of cable models has been the subject of preliminary tests. Associated work on overhead lines has covered current carrying capacity, electrical characteristics, and aluminium conductor connectors, while progress has been made in the development of a model transmission line for the analysis of some h.v. d.c. problems.

Surge Phenomena

A design of surge filter found to be effective for transformer protection when tested in the laboratory is now being tried in the field at a B.E.A. 33 kV substation. Another line of approach to surge problems has been the trial of various forms of commercial expulsion gap, including tests after prolonged weathering.

Work on lightning proceeds in various ways, both theoretical investigations and practical trials being invoked to provide information. The collection of lightning fault statistics is being actively pursued, and both the Area Boards and the Central Authority are cooperating. Analysis of a continuous surge recording equipment which was installed at Oxford 132 kV substation has been undertaken during the year, and the equipment has been transferred to the Meaford 132 kV sub.

Short circuit stresses in transformers have been closely investigated, and now various thermal problems are to be examined. As a start the specific problem of the effect of duct width on the temperature conditions of a distribution transformer with crossover coils is to be taken. Stray losses, line currents due to internal faults, and losses at low power factor in large transformers are among other transformer problems that have attracted attention.

The economics of earthing and the efficacy of earth electrodes have been investigated during the year, and certain important problems in connection with earth circuit continuity have received consideration. Another aspect of safety consideration is the problem of increasing incidence of fires in radio sets.

RATE OF CHANGE MEASUREMENT

An Instrument for Checking Grid Frequency

IT has long been known that an instrument measuring the rate of change of frequency as compared with an instrument measuring the true frequency would be of great value in controlling the grid in time of heavy overloading. Two instruments of this type have in fact already been made and are in use. A third type was described by Messrs. E. Bradshaw and M. Z. Tangeloglu at the Measurements Section Meeting of the I.E.E. last week.

The instrument operates by using a self-balancing frequency sensitive bridge, the balancing being carried out by a servo motor which is operated by the output from the bridge which occurs when the input frequency changes. By arranging that the angular rotation of the motor is linearly related to the change of frequency causing the rotation, the mean speed of the motor over a given period is a measure of the mean rate of change of system frequency over that period.

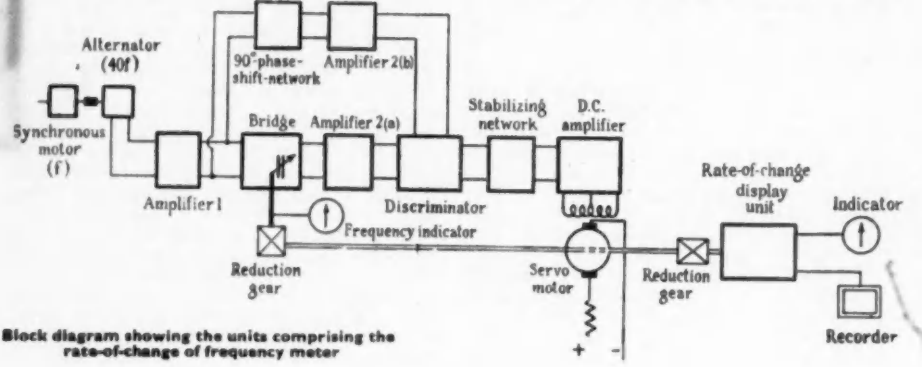
The display unit, which is coupled to the servo motor, displays on indicating and recording meters, every thirty seconds, the mean rate of rotation of the servo motor and hence the mean rate of change of frequency measured over two-minute periods.

While the principle is quite straight-forward, there are in fact many design details requiring fairly elaborate equipment. First the input frequency must be sufficiently high to facilitate design of the bridge and associated tuned circuits, and should be an even multiple of the mains supply. In this case it is taken as 2,000 c/s, derived from a high frequency alternator driven by a 3,000 r.p.m. synchronous motor. To improve the waveform from the h.f. alternator, and to make a fairly high voltage available to the bridge terminals, a band-pass amplifier is included between the alternator and the bridge. The bridge itself is a parallel-T, RC-network which gives a zero output when correctly balanced and fed with a pure sine wave. The characteristics are such that the unbalance output voltage is, for small deviations of frequency, proportional to that deviation, and leads or lags behind the input voltage by 90° according to whether the frequency increases or decreases. Capacitance variation was chosen as the balancing function to eliminate mechanical wear. Output from the bridge is fed into an a.c./d.c. discriminator via a second amplifier, and compared with a reference voltage fed from the output of the amplifier before the bridge. This voltage is also passed through a 90° phase shift network and a band-pass amplifier similar to the second pre-discriminator amplifier so that phase shifts are cancelled out. The magnitude of the direct voltage output of the discriminator is thus made sensibly proportional to the magnitude of the a.c. bridge output voltage (independent of mains voltage variation) and its polarity is dependent on the phase of the bridge output voltage. This d.c. voltage is passed through a d.c. amplifier, and fed to a split field servo motor which runs at a speed proportional to the bridge output voltage with a direction dependent on the polarity. The motor output is fed back to the balancing condensers in the bridge via a gear train.

Display Unit

It was found out early in the investigation that for the mean speed of the motor to have any significance it should be measured over a period of two minutes. Further, the random speed of variation of the rate of change of a system was such that measurements of rate of change, even over a period of 30 seconds, were useless.

The ideal method would be to display continuously the mean rate of change over the preceding 120 secs. No satisfactory solution was found, and the display system was therefore arranged to present, every 30 secs., the



Block diagram showing the units comprising the rate-of-change of frequency meter

mean rate of change of frequency measured over the preceding 120 secs. A centre-tapped resistance, with a sliding contact which could move either side of the centre contact was therefore used as the basic measuring system. With a constant voltage across the resistance and with the moving contact driven by the servo motor, the output voltage between the fixed and moving contacts would be proportional to the number of revolutions of the motor. In practice six such units were used, each being connected via a timing mechanism and clutches in such a way as to give a continuous coverage of the system in thirty-second intervals, but each individual unit having a 30-second resetting period and a 120-second loading period.

The output from the recording system is displayed both on a voltmeter calibrated in c/s and on a continuous recording chart.

DISCUSSION

MR. A. FELTON (N.P.L.) expressed his admiration for the elegant way in which the Authors had solved their problem by a neat combination of electronic and mechanical techniques, but said that he was surprised at the inference that rate of change of frequency was more useful as information to the control engineer than an indication of frequency.

MR. J. R. THOMSON (B.E.A., Manchester) said that during the last three months they had had an opportunity in the Manchester grid control room to observe the operation of the Authors' instrument. The instrument was not kept in continuous use, but was switched on prior to those periods when rapidly changing load conditions normally occurred. Such an instrument, permanently installed in every control room, should in his opinion be kept in service continuously, in view of the assistance which it could give to the control engineer in the regulation of frequency. On the grid, the loadings on the inter-area tie lines were known only to the control engineers.

MR. W. L. GARFIELD (Standard Telephones and Cables, Ltd.) mentioned that he had been connected with the development of an instrument required by the National and South-East Regional Control of the C.E.B., which presented an interesting comparison in technique with that of the Authors. The Authors held that the rate of change should be measured over an interval of two minutes, but he had found that in the part of the country with which he was concerned at any rate it could be measured over a period of one minute, and by making the period of renewal of readings the same as that over which the readings were measured considerable simplification resulted. The instrument to which he referred had been in use since the winter of 1947 and was often consulted in regard to load shedding.

MR. E. C. SCOTT (B.E.A.) said that the statutory standard of frequency control was $+1\%$, but in order to regulate frequency on an interconnected system a much higher accuracy was required, and they asked for, and to some extent received, an accuracy of 0·1%. That was important, *inter alia*, on economic considerations. It was desirable to make the fullest use of the grid in restricting generation to the most efficient stations, where the cost was lowest, and that necessitated a stable frequency, because if the frequency varied by only 0·1 c/s there might be fluctuations on the line of up to 15,000 kW. It was essential, therefore, to have frequency instruments which were stable and accurate to that degree.

The rate of change of frequency meter described by the Authors was of tremendous assistance to the control engineer in making it possible to detect changes of frequency almost before they occurred, and frequency could not be maintained constant without anticipation.

MR. F. R. AXWORTHY (Everett Edgcumbe) pointed out that the need for the Authors' instrument arose as a result of the necessity for load shedding, and asked whether when the time arrived when there was sufficient capacity to meet the demand there would be any further use for the instrument.

DR. E. BRADSHAW replied to the discussion.

METERING WELDING LOADS

THE problem of metering welding loads, particularly with automatic welders, presents considerable difficulty, as the welding time is short (sometimes less than 10 cycles) and the current taken was high.

Mr. G. F. Shotter, discussed these difficulties at a meeting of the Measurements Section of the I.E.E. held recently.

Two factors needed measuring: the kWh, which was relatively small, and the maximum demand, which was most important.

Preliminary tests showed that the readings obtained on conventional types of maximum demand instruments (such as thermal and induction types) with resistance-welding loads were determined by various factors which were largely unpredictable in practice. In order to obtain a sensible reading on a demand indicator it was necessary to put in one or more instruments and a current transformer having a rating as low as a third or a quarter of the peak r.m.s. current taken by the welding set. It was therefore essential to employ Stalloy rather than Mumetal cores for the transformers owing to the large inaccuracies of Mumetal at four times full rating.

Although the peak current taken by welding sets could be used as a basis for tariffs, so far only oscillographs had been available to take the required measurements. He (Mr. Shotter) had, however, designed an instrument which could be used with a conventional instrument to record accurately the peak current.

For measuring the kWh the usual watt-hour meter was satisfactory providing it had no creep slots or at least a minimum anti-creep compensation.

VOLTAGE STABILISATION

A New High Accuracy Laboratory Instrument

DETAILS of a high accuracy electronic a.c. voltage stabiliser were given by Dr. G. N. Patchett in a paper delivered to the I.E.E. Measurements section last week.

He began by giving the requirements necessary in a voltage stabiliser and pointed out that essentially the stabiliser consisted of two parts: an "indicator" and a "controller." The indicator had to detect any changes in voltage, and produce a signal to operate the controller whose function was to make the necessary correction to the output voltage of the stabiliser.

In the particular amplifier described a thermistor resistance bridge was used as the indicator element. The characteristics of the bridge were such that a small change of voltage either way could produce a comparatively large change of current. The controller on the other hand utilised a push-pull type of circuit which had the advantage that it could operate at all power factors and at any load from zero to maximum. An alternative controller was described which could give a power of 240 watts.

The schematic circuit of the equipment is shown in the line diagram. The input is fed through the controller transformer TR2 to the output terminals, across which is connected the indicator transformer TR1 arranged with a potential divider P_1 to give external control of the output voltage. The thermistor bridge consisting of r_3 and T_1 (the other arms being the transformer windings) has a temperature compensating circuit T_2 r_5 applied to it. In normal operation the contact B_2 is closed, short-circuiting TR3. The output from the bridge is fed through a filter to remove third harmonics and amplified by V_3 and V_4. Again normally relays A_1 A_2 are closed, so that V_4 feeds V_5 which in turn feeds the controller valves through TR4. The remainder of the circuit is used for protection purposes and to prevent the thermistor bridge moving into instability. The accuracy of the stabiliser is such that it will keep output voltages accurate to 0·1 to 0·01% with changes of 10 volts in the mains input voltage and with outputs up to 3 amperes. It is independent of power factor changes, and retains its accuracy between 48-52 c/s mains frequency.

DISCUSSION

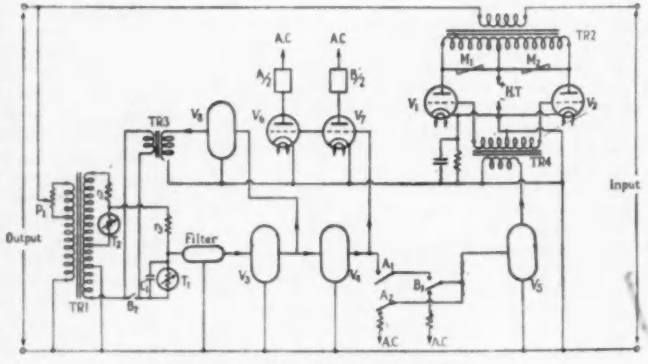
MR. ARVON GLYNNE (Manchester College of Technology) said that a voltage stabiliser was intended for certain duties, and the duties must be specified before specifying the performance required. So long as it did the job for which it was intended there was no need for it to be any better, and any stability beyond that required was merely surplus, and might be detrimental if it had to be paid for by the use of complicated and expensive apparatus.

MR. F. C. WIDDIS (H. Tinsley and Co.) emphasised that a stabiliser should be a device which one could put in and which would give what was wanted, but which one could then forget about. Dr. Patchett's stabiliser seemed to be the first genuine attempt to meet this requirement. A number of these stabilisers had been built and had been found most reliable. Their performance was remarkable, and they were absolutely fool-proof in operation, which was essential for a commercial instrument. Their main use was in high precision a.c. measurements, and particularly in a.c. potentiometry. A surprising thing about the instrument, in view of the employment of a thermistor, was the extremely low drift.

DR. G. MOLE (E.R.A.) said that Dr. Patchett's instrument made it possible to provide a highly satisfactory source of a.c. voltage. Its performance was particularly good as regards output impedance and transient response or dynamic stability.

DR. L. G. A. SIMS (R.A.F. Technical Establishment) pointed out that in a.c. potentiometry, unlike the d.c. case, variations of mains supply might pass unnoticed without a stabiliser. That was a good reason for taking a.c. stabilisation very seriously. The high degree of stability of Dr. Patchett's instrument was particularly welcome.

DR. G. N. PATCHETT briefly replied.



Schematic circuit diagram of stabiliser

Lighting the South Bank Site . . .

. . . The use of floodlighting as a decorative medium is well known, but a less familiar application is illustrated in these pictures. Here the technique has been applied to assist night work during the building of the new Concert Hall on the South Bank of the River Thames by Holland, Hannen and Cubitts Ltd.

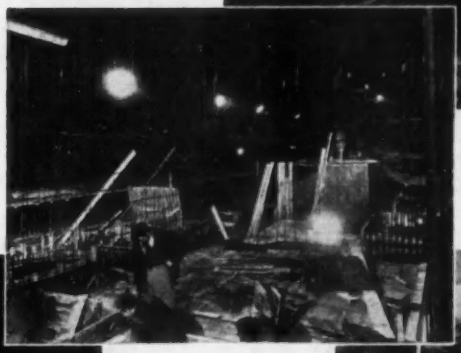
The nature of the constructional work being undertaken and the rapidly changing scene over a large area of operations presented many difficulties and precluded the installation of a normal overhead lighting scheme, yet demanded a standard of illumination which would ensure safe and efficient working conditions after the hours of darkness.

How these requirements were met is shown in these photographs of the lighting system designed and installed by Engineering Service Installations Ltd. The main installation consists of a ring of 500 W floodlight projectors around the periphery of the site, the units being mounted on the scaffolding and rising as the building progresses. These provide the basic overall lighting of the open areas.

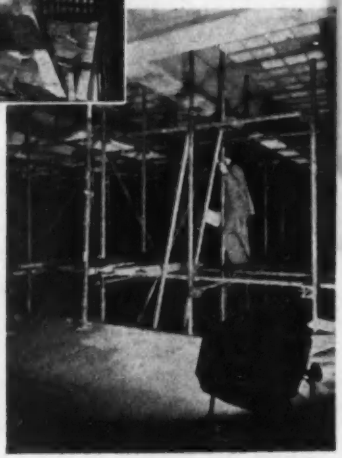
Advantage has also been taken of the existence of towers erected for the use of surveyors upon which have been mounted 1,000 W spotlight units to give additional illumination over the central area. Portable 500 W floodlights are provided for boosting localised dark areas as required.

As the building construction proceeds and shuttering and concreting is in progress, the lighting between floors is provided by floodlights trained on to the underside of the upper floor.

The present total loading of this installation is of the order of 50 kW.



Above and left. The main ring of 500 W floodlights give a high standard of lighting



Top left. The Concert Hall site seen in perspective

Left. 1,000 W spotlight units mounted on towers give additional illumination

Right. Floodlights trained upwards provide semi indirect lighting between floors

OVERSEAS NEWS

Expansion in Norway

Last year a further 265,000 kW of new generating plant was brought into commission in Norway, bringing the country's total plant capacity to about 3 million kW. Giving these figures recently, Mr. F. Vogt, general manager of the Norwegian Water, Power and Electricity Authority, said he considered that a rate of 150,000 kW of new plant capacity per annum could be maintained in the next few years. Norway had at present on order from abroad turbines aggregating some 180,000 h.p. and generator sets totalling about 350,000 kVA.

Tully Falls Scheme

The Cairns Regional Electricity Board, Queensland, has received formal notice that the State Cabinet has approved of the construction of the first stage of the Tully Falls hydro-electric scheme. The State Government has approved a 33⅓% subsidy on £6,455,000 of the cost of the first stage. Total cost of the first stage will be £7,500,000. When fully developed the scheme will permit the annual generation of 344 million units, with a peak load of 69,000 kW. It is anticipated that the scheme will be in operation in 1955-56. The estimated cost of providing a supply to the Cairns region, which will depend on the installation of additional diesel plant until the Tully scheme is operating, will be £20,000 monthly for every month's delay in the commissioning of the scheme.

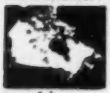
Boilers for Port Augusta

Contracts valued at approximately £A1,500,000 have recently been placed with Riley Dodds (Aust.) Pty. Ltd., of Melbourne, by the Electricity Trust of South Australia, for the supply of four boiler units, each of 175 klb/hr, for the new Port Augusta power station. It is understood that Riley Dodds (Aust.) Pty. will manufacture most of the parts locally, under licence from the Riley Stoker Corpn. of America.

Brisbane Railway Electrification

A further report on the electrification of the suburban railways between Sandgate, Brisbane, and Ipswich is expected to be made to the Queensland State Government shortly. Mr. J. Moffat, electrical rolling stock supervisor for the N.S.W. Government, is expected to arrive in Brisbane this week to finalise his report on the quantities of materials needed for the job of electrification and the estimated costs. Mr. Moffat was originally expected to submit his report some months ago, but illness and pressure of work has delayed matters. (According to the report made to the Government in November, 1947, the electrification scheme was estimated to cost £2,504,660, and proposed taking power supplies from the City Electric Light Co. and the City Council undertaking.)

Canadian Import Restrictions



Some easing of Canada's import restrictions were announced in Ottawa last week. With effect from July 1 next, refrigerators, washing machines and radio receivers are taken off the prohibited list and included in Category 4 of the quota list (i.e. 50% of 1946/47 imports). Other items removed from the prohibited list and placed under open general permit and from scheduled countries against existing Category 4 quotas are electric dishwashers, mixers and ironers, juice extractors and garbage disposal units. In addition, electric light bulbs are transferred, as from April 1, from the prohibited list to Category 4 of the quota list.

Factory Expansion

A further expansion of its plant in London, Ontario, at an estimated cost of $2,600,000 this year, has been announced by the president and general manager of Kelvinator of Canada. The building programme will almost double the present floor space by 1951. It is planned to make the firm more self-sustaining, and to decrease expenditure in the U.S.A. In addition, close connection with Kelvinator Ltd. of England will be developed, and a greater proportion of parts and equipment obtained from Britain.

Alcan's New Project

The controller of British Columbia's water rights, Maj. R. C. Farrow, has announced that he is prepared to issue a licence to the Aluminium Co. of Canada covering power development of the Nechako-Nanika rivers systems in the northern part of the province. Formal issue of the licences may take place this year as objectors have one month in which to lodge an appeal. Although it may be two years before the Aluminium Co. of Canada could complete its surveys, Maj. Farrow intimated that it would be unfair to require the company to spend large sums of money without any assurance that it would be granted a licence.

Indian Production

Figures just released in New Delhi show that production of electrical goods is rising. Thus, in 1949, a total of 69,540 h.p. of electric motors were made, as against 60,000 h.p. in 1948. Transformers increased from 81,973 kW in 1948 to 103,133 kW last year, while corresponding figures for electric lamps were 9 million and 13 million, and for conduit 1·7 and 3·01 million feet.

Pakistan-Japan Trade

Details of the trade agreement between Pakistan and Japan, recently announced, show that the latter country is to supply hydro-electric plant and equipment to the value of Rs. 15 lakhs, and other electrical goods valued at Rs. 25 lakhs. The agreement covers the twelve months ending June 30, 1950.

Indian Plastics Industry

The Government of India has decided to accept, in the main, the proposal of the Tariff Board in regard to plastic goods and moulding powder. In this the Board recommended that protection should be granted up to March 31, 1953, and that the existing 30% revenue duty on phenol-formaldehyde moulding powder should be converted into a protective duty. In respect of electrical accessories, such as switches, lamp-holders, wallplugs and ceiling roses, the existing revenue duty should be converted into a protective duty, the present preferential rate of 24% in respect of U.K. imports being increased to 30%, and the standard rate adjusted in accordance with the terms of the 1939 trade agreement.

The Board also suggests that in view of the necessity for standardising plastic ware and nationalisation of its production, particularly for industrial articles such as electrical accessories, the scheme recommended by the Panel on Plastics and Celluloid Industries for establishing a central mould-making shop as part of the proposed central machine tool factory, should receive early and favourable consideration. The Government is studying this matter.

Another Project?

The Government of India has decided to set up a Rajasthan Underground Water Board to direct explorations and development of the underground water resources of Rajasthan. Among the members of the Board is Shri Padmanabhan, chief electrical engineer of Rajasthan.

El Salvador Scheme

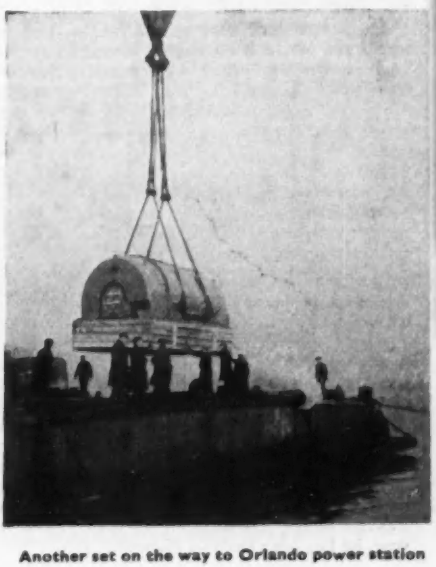
With the International Bank having agreed to loan the Government of El Salvador approximately $12 millions to cover the cost of the proposed hydro-electric scheme at Guava Falls on the River Lempa, the National Electric Commission now propose to go ahead with the scheme. It involves the construction of a dam 64 metres high by 500 metres long, and an underground power station. In this will be installed two 21,000 h.p. water turbines utilising a fall of between 177 ft. and 144 ft., and two generators each of nearly 16,700 kW capacity. Directly above the station will be a substation feeding 115 kV lines, one to San Salvador and one to San Miguel. It is planned to have the project in operation by July, 1952. Six main contracts are to be awarded under the scheme: (a) dam construction; (b) turbines; (c) generators; (d) mechanical equipment; (e) electrical equipment, and (d) transmission lines. Meanwhile lists of suitable contractors are being prepared. Interested firms should communicate quickly with H.M. Minister and Consul-General, British Legation, San Salvador.

N.Z. Proposal

At the conference of the Power Supply Authorities Association in Wellington, N.Z., this month, under the chairmanship of Mr. Goosman, Minister in charge of the State Hydro-Electric Department, it was decided to recommend the Government to obtain immediately the services of British consulting engineers to assist in formulating proposals for an addition to the present King's Wharf, Auckland, power station, and to tender advice regarding steam plants generally. In the North Island, hydro-electric development should proceed as rapidly as possible along the present lines, and it was agreed that the major part of the Island's supply would be derived from water power for some time to come. It was hoped to have practical evidence within 18 months of whether geothermic power could be developed in New Zealand.

Plant for Orlando

Our picture shows the fourth 47,000 kVA, 3,000 r.p.m. G.E.C. turbo-alternator for the Orlando power station, Johannesburg, being loaded in the S.S. *Geologist* at Birkenhead recently. A fifth set of the same rating is approaching completion and a further five 37,500 kVA sets are being built, to bring the total capacity of this station up to 422,500 kVA, with all G.E.C. sets.



Another set on the way to Orlando power station

PERSONALITIES

In the Industry

For their new diesel-engined generating station, the Isle of Man Electricity Board has selected **Mr. F. J. Riches** as power station superintendent. For some time he has been senior maintenance engineer of the diesel sets at Southend-on-Sea, Eastern Division, B.E.A. He gained technical training at London Engineering College, and after a spell at sea in the R.N.R. and Merchant Service, first worked at Southend with Belliss and Morcom Ltd., on the installation of the 1,750 b.h.p. M.A.N. (ex-U-boat) diesel sets, taking charge of the four units at Leigh-on-Sea upon commissioning. Later he became senior maintenance engineer of all Southend Corporation electricity plant.

Mr. F. J. Riches

As he is no longer permanently resident in England, **Mr. V. A. Lowinger,** C.B.E., has retired from the chairmanship of the International Tin Research and Development Council, which controls the Tin Research Institute. His successor is **Mr. G. F. A. Burgess,** a joint managing director of the British Metal Corporation, Ltd.

The St. Helens Cable and Rubber Co., Ltd., has appointed **Mr. J. C. Laing** as area manager and engineer for Derbyshire, Leicestershire, Lincolnshire, Nottinghamshire and Northamptonshire. He served an apprenticeship with Newton Bros. (Derby), Ltd., subsequently joining Derby Colliery (Drury-Lowe) Ltd., where he became chief engineer. After 18 years' with that company he was appointed technical representative in the Midlands for Hardypick, Ltd. He is a past branch president of the Association of Mining Electrical and Mechanical Engineers.

The State Electricity Commission of Victoria, Australia, has promoted **Mr. N. T. Jewell** to head of the Design and Construction Section of the Electrical Branch in succession to **Mr. E. L. Merigan,** B.E.E., who, as we exclusively reported last week, has been appointed Associate Commissioner of the Snowy Mountains Authority. Mr. Jewell joined the Commission in January, 1922. He became tests engineer in 1927, and from 1933 to 1937, was tariff officer. In the latter year, he was appointed assistant chief distribution engineer and became chief distribution engineer, Electric Supply Department, in 1944. Since last year, he has been head of research.

Measurement Ltd. announce that a re-organisation of their representation has been effected, and that in regard to the East Midlands Board Area, **Mr. R. M. W. Kullman,** M.B.E., will act *vice* **Mr. C. W. Clark.** In addition, **Mr. H. Horwood,** A.M.I.E.E., who is the Company's technical sales engineer for Telemetering and Actadis ripple control equipment, has, in addition to these duties, been appointed an area sales manager for electricity meters.

Due to retire this month, **Mr. J. F. Colquhoun,** F.I.E.S., has been city lighting engineer of Sheffield since May, 1924. During that time, a large variety of changes have taken place in the city's street lighting, although gas lighting has not yet been ousted. As an indication of the trend, the total number of lamps in use in the city in May, 1924, was 11,112, the figure today being 26,645, of which 14,255 are electric. Well-known throughout the lighting industry, Mr. Colquhoun has been a member of the B.S.I. committee on the Specification for Street Lighting since 1928. He is also a member of the committee at present sitting on the Code of Practice for Street Lighting. President of the Association of Public Lighting Engineers in 1928/29, he has also attended meetings of the International Commission on Illumination in various countries as a member of the British delegation. As work of esteem Mr. Colquhoun has been presented with a gold watch by the chief officials of the Sheffield Corporation.

Mr. J. F. Colquhoun

Newly appointed sales manager of the Motor Department of the Metropolitan-Vickers Electrical Co., Ltd., is **Mr. W. Hall,** B.Sc.(Tech.), who since February, 1947, has been assistant to the sales manager. He received technical education at Manchester College of Technology, and on completion of a college apprenticeship with the company in 1924, he became a sales engineer in the Motor Sales Department.

Mr. W. Hall

Mr. J. B. McMillan

Mr. P. T. V. Page

In the expansion of the educational activities of E.M.I. Institutes, Ltd., new premises at 10 Pembridge Square, W.2, have been acquired, and two new staff appointments made. For the new post of director of college studies, **Mr. J. B. McMillan,** M.A., B.SC., has been chosen, while **Mr. P. T. V. Page,** B.SC., A.M.I.E.E. is director of postal studies. Mr. McMillan has been with E.M.I. Institutes since January, 1947, first as lecturer and latterly as senior instructor. Mr. Page has been head of the Telecommunications Department at Dartford Technical College. Prior to the war, he was lecturer in electrical engineering at the Military College of Science, Bury, after service with Metropolitan-Vickers Electrical Co., and the Westinghouse Brake and Signal Co.

Chief technical engineer of Harland and Wolff, Ltd., **Mr. C. C. Pounder** has been awarded the James Clayton prize by the Institution of Mechanical Engineers in recognition of his work for progressive design for steam turbines and diesel engines.

At the end of this month, **Mr. W. A. Park** will sever his connection with the Manchester exporters for whom he has acted as electrical buyer for many years, and latterly as radio buyer also.

The triennial award of the Coopers Hill War Memorial prize and medal, which fell in 1949 to the I.E.E., has been made by the Council to **Mr. E. D. Taylor,** M.SC., for his paper on "The Measurement of Interlamination Resistance on Varnished Insulated Sheet Steel for Large Electrical Machines."

Among the members of the newly reconstituted Inland Water Survey Committee, are **Mr. J. D. Peattie,** B.SC., A.C.G.I., M.I.E.E., deputy chief engineer (generation), B.E.A., and **Mr. A. A. Fulton,** M.Inst.C.E., chief hydraulic and civil engineer to the North of Scotland Hydro-Electric Board.

At present manager of the Swindon District, No. 2 area of the Southern Electricity Board, **Mr. H. R. Farries,** B.SC., A.M.I.E.E., has been appointed to a similar position at Aldershot, No. 3 Sub-Area. Prior to vesting day, Mr. Farries was deputy borough electrical engineer to the Corporation of Brentford and Chiswick. He has held his present post since November, 1948. Earlier he had served with the Islington, Battersea and Nuneaton undertakings.

Plans have been made for **Mr. W. H. Connolly,** B.E.E., B.Com., A.M.I.E.Aust., assistant to the general manager of the State Electricity Commission of Victoria, Australia, to make a six months' tour of Europe and America to study the administration and operation of large electricity supply organisations. He is expected in this country in about four months' time.

Previously assistant secretary, **Mr. H. L. Jarvis,** A.I.A.C., has been appointed secretary to the Plessey Co., Ltd.

His friends in the electricity supply industry will be interested to know that **Mr. D. A. J. Welch,** A.C.W.A., accountant to the Crawley District of the South Eastern Board, has been appointed accountant to the Surrey Fine Art Press, Ltd., of Redhill, and an associated company. The termination of his Crawley appointment will take place later this month.

Mr. T. C. Bell has joined the Revo Electric Co. Ltd. as representative at the Newcastle-upon-Tyne branch.

Our picture below shows **Mr. J. Gogan,** chief commercial officer of the South West Scotland Electricity Board presenting an engraved silver drinking bowl—known in the Gaelic as a "cuach" —to **Miss E. A. Dinwiddie,** of the Annan service centre, which headed League "A" in the Board's monthly competition for window displays during the past year. To obviate unequal contests, two leagues were devised—"A" for the larger service centres and "B" for the lesser ones, and marks awarded for various points. Winners in the "B" league were Lanark service centre, which also received a similar silver bowl.

Miss E. A. Dinwiddie receives the bowl for Annan

His friends will be interested to learn that **Mr. J. H. Cresswell**, supplies director of Revo Electric Co., Ltd., has been elected president of the Warwickshire and Worcestershire Counties Bowling Association.

Mr. J. W. Ridding has been appointed head of the Patent Departments of Associated Electrical Industries, Ltd., in succession to the late **Mr. A. S. Cachemaille.**

Mr. M. Heaton, manager of the Electrical Department of the Blyth Dry Docks and Shipbuilding Co., Ltd., has been appointed general manager of the Fairless Engineering Co., Ltd., of Stockton-on-Tees.

OBITUARY

We learn with regret of the recent death of **Mr. J. B. Grey**, A.M.I.E.E., A.M.N.Z.I.E., Assoc.A.I.E.E., aged 60, secretary of the Electric Supply Authority Engineers Institute, New Zealand.

We note, with regret, the death on February 5 of **Mr. R. F. Mayer**, aged 54, who was well known throughout the electric lamp industry. For the past 12 years he had been closely associated with Thorn Electrical Industries Ltd., being concerned with the administration of the Lamp Sales Department, and for many years in charge of export development. He was also a director of Lamp Presscaps, Ltd.

We regret to record the death, on February 3, of **Mr. W. A. Walker**, A.M.I.E.E., aged 70, who was borough electrical engineer of Kettering from 1905 until his retirement at the end of 1943. He went to Kettering in 1904 as chief assistant after serving in a similar capacity with the Aldershot undertaking. At Kettering, he really put the town on the electrical map, initiating a rural electrification scheme covering nearly 50 sq miles. He also furthered the provision of electrical facilities in the Kettering urban area—especially an "all-in" scheme for smaller houses. He served on the council of the I.M.E.A., and on the Electric Vehicle Committee, and was for two years president of the Association of Municipal Electrical Engineers.

The death occurred, on February 6, of **Mr. W. J. Cusack**, aged 78, who served for over 40 years with the British Thomson-Houston Co., Ltd. He became manager of the firm's Manchester district office in 1907, and ten years later returned to Rugby as manager of all district offices. With the growth of business, a reorganisation took place in 1932, and from that date until his retirement in 1944, he was engaged on matters relating to the district offices.

We note the death, on February 7, of **Mr. J. Parker**, aged 71, formerly buyer to the Craigpark Electric Cable Co., Ltd.

The death occurred in Barcelona on February 1, of **Mr. H. G. Dennes**, A.M.I.E.E.

The death occurred recently of **Mr. L. A. Darby**, aged 63, manager of the London Depot of the Chloride Electrical Storage Co. Ltd.

I.E.E. Measurements Section

PRINCIPAL guests at the annual dinner of the I.E.E. Measurements Section on Wednesday of last week were Mr. H. Bishop (vice-president I.E.E.), representing Professor Moullin, and Sir Vincent de Ferranti.

"Our Guests" was proposed by the chairman, Professor Grieg. In reply, Mr. H. Bishop referred to the advantages of sectionalising the I.E.E. In his opinion an atmosphere of healthy competition such as existed between the sections was a considerable factor in nurturing a corporate spirit.

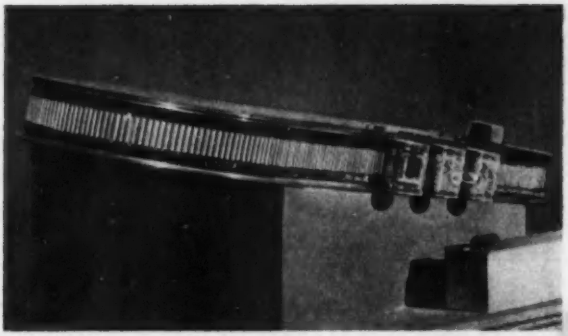
Sir Vincent de Ferranti, who also replied, referred to the diversity of interests of the Measurements Section which ranged from the realms of pure science to those who collected money. It was easy to feel superior about the commercial aspect of measurements, but the collection of £200 million a year was a considerable responsibility. Referring to his father's invention, at the age of 17, of the mercury motor meter, he said that Dr. Ferranti was the first to realise that accurate metering was as important a part of electricity supply as any other aspect. Dr. Ferranti had taken a broad view of the matter.

There was a need for a broader view in commercial measurement. Just as the B.B.C., to judge from Mr. Wynn's paper, had realised that there was an economic limit to providing precautions against breakdown, so he believed that there was an economic limit to the accuracy provided by commercial measurement, and in his view millions of pounds were being wasted in demanding an unnecessary degree of accuracy in metering. It seemed impossible, however, to make the B.E.A. take a broad commercial view of the situation. With perhaps twenty million meters in service, the diversity was such that phenomenal accuracy was not required.

Dr. G. A. V. Sowter, proposing the toast of "The Chairman," mentioned the friendly rivalry between sections and paid a tribute to Professor Grieg's academic and personal qualities. Professor Grieg, in reply, referred to the catholicity of interests of the Measurements Section despite its relatively small size. Its activities, as seen from the chair, seemed to indicate that it was under such considerable pressure that one was unable to stand back and regard the whole. He spoke regretfully of the days when science moved at a slower pace, illustrating with quotations from *Pepys' Diary*.

MAGNETIC CONVEYOR for TIN CANS

A New Application of Electro-Magnetism



AN unusual electro-magnetic can conveyor has been built as an experiment to the order of Tate and Lyle, Ltd., by the British Thomson-Houston Co., Ltd., Rugby. (Patent appln. 31551/49). The purpose of the device is to facilitate the handling of empty syrup cans during manufacture, and conveying them to the filling department, in a manner least likely to cause damage to their enamelled surfaces.

The conveyor is in effect an elongated electro-magnet and incorporates a vertically placed track to which the cans adhere, upright, like keepers across the poles of a magnet. The track, along which the cans move by rolling on their rims, consists of a pair of running rails and a middle (motivating) rail, and all three rails constitute poles of the electro-magnet. The cans are propelled along the track by travelling waves of magnetic force which are induced in the middle rail. As each can remains automatically at the crest of a wave its speed depends on the speed of the travelling waves, which is variable, and the spacing coincides with that of the wave crests.

Method of Operation

Reference to the accompanying diagrams will enable the following more detailed description of the conveyor and the method of working to be readily understood. Fig. 1 is a cross-section of the conveyor and Fig. 2 is a diagram of connections.

The magnetic circuit of the conveyor is of E-shaped cross-section. It consists of a back plate, or yoke, to which are attached, along the upper and lower edges, two steel strips, or false running rails, and along the middle a steel bar, or middle rail. To the front face of the steel bar is fastened a large number of bent steel strips of U-shaped section assembled closely side by side so as to form, in effect, alternate teeth and slots along the face of the middle rail. The running rails proper are screwed to the false rails and are of brass in order to avoid the risk of sticking and excessive friction which would result from the use of steel rails.

The conveyor is energised from a d.c. source. The windings are in two portions, of which one is a developed d.c. armature winding laid in the slots in the face of the middle rail and connected to a stationary commutator, and the other is a main exciting, or field, winding consisting of elongated coils laid behind the armature winding and parallel with and embracing the middle rail.

The object of the field winding is to provide the m.m.f. necessary to hold the cans on to the track, which is magnetised so that the middle rail is of one polarity and the running rails are of the opposite polarity throughout the length of the track. The purpose of the armature winding is to concentrate the m.m.f. along the middle rail at uniformly spaced points, which are made to travel along the rail by means of

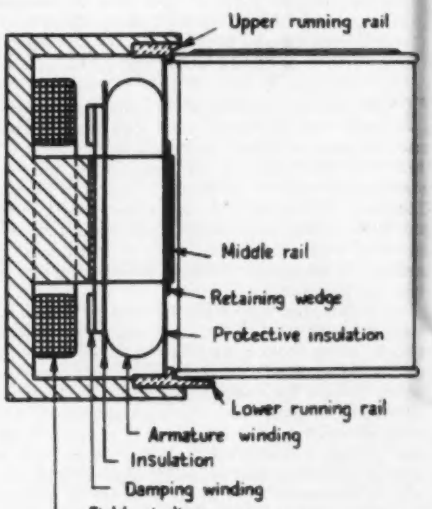


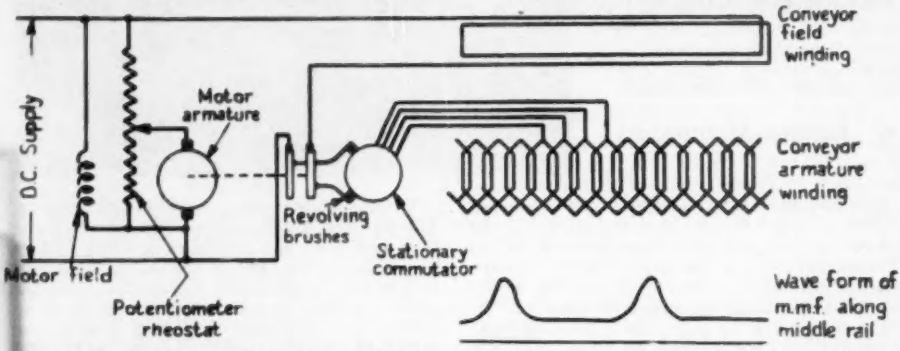
Fig. 1. Section through the conveyor system, the can in transit being on the right-hand side

brushgear round the stationary commutator to which the winding is connected. Current is passed to and from the revolving brushes through sliprings, the brushes being driven by a small variable speed motor. It is convenient for this to be a d.c. machine, the armature of which is supplied from a potentiometer-connected rheostat, enabling the speed to be varied down to standstill.

The two windings are connected in series, but the operation would not be unduly affected if a parallel connection were used since the "back e.m.f." generated by movement of the cans is very small.

An important feature of the design is the strong locating or "synchronising" force which the device possesses. This has been achieved by a suitable pitching of the coils of the armature winding in conjunction with a correspondingly chosen spacing of the revolving brushes. The effect is that the distribution or "wave-form" of the m.m.f. along the middle rail has pronounced narrow peaks and broad valleys. In this manner the desired large synchronising force is obtained with a minimum expenditure of electrical energy.

Fig. 2. Schematic circuit diagram of connections to conveyor showing generation of m.m.f.



Oscillations of the cans set up by irregularities in the rims or the running rails are minimised by a damping (squirrel-cage) winding laid in the slots with the armature winding. Sparking at the commutator is also greatly reduced by this damping winding.

Dimming of Fluorescent Lamps

THE broad principles of dimming fluorescent lamps for stage purposes, and the circuits used have already been described in our issue of May 12, 1949, wherein we described a demonstration given by Dr. Strange on behalf of Thorn Electrical Industries Ltd. His paper read before the Illuminating Engineering Society on Tuesday of this week, however, gave a considerable amount of additional technical information which was not previously available.

As before, the most suitable lamp for dimming circuits is the 2 ft 40 watt lamp, which is operated two in series from a modified Quickstart circuit giving independent cathode heating, and a separate series resistor for controlling each pair of lamps. Grouping of pairs on a common resistor is not satisfactory, since the first lamp to strike reduces the voltage available for the other lamps. While saturable reactors may be used in place of resistors, it is difficult to obtain full range dimming without excessive size and cost. The range of dimming obtainable with the 2 ft 40 watt lamp is of the order of 300·1.

As is well known, the operation of the "Quickstart" circuit, with its relatively low striking voltage, is dependent upon the presence of an earth strip in close proximity to the tube and, as an example, it is found that the striking voltage of an 80 watt lamp may vary between 170 and 270 volts, according to the area and distance away of the earth strip. The condition of the glass surface is of importance in the operation, and curves show that between 60% and 100% relative humidity, the minimum striking volts are approximately doubled.

Relative Efficiency

The difference in efficiency between fluorescent and tungsten lamps is emphasised in stage lighting where most colours can be obtained in the case of fluorescent lamps by variation in phosphors, instead of by the use of filters, although these are still required in the case of certain saturated colours. Relative efficiencies for typical blue, green, and red lamps respectively are 40-1, 11-1 and 4-1, as compared with the normal 2 or 3 to 1 for white fluorescent and unfiltered tungsten. Another advantage for stage use is, of course, the absence of shadow and uniformity of the lighting obtainable, and the reduction in heat and glare.

French Instrumentation

Contemporary Products shown at the Science Museum

APPLICATIONS of science to industry have taken on an international flavour this month with the staging of an exhibition of French scientific instruments at the Science Museum, South Kensington. Opened a week ago by the Commercial Councillor to the French Embassy, this interesting display will be on show to the public until February 26. It is not suggested that the exhibition includes any completely new developments; rather, the object is to show how French scientists and engineers have solved problems common to work in both countries. Where the solutions are similar to those of British workers, but reached by different paths, the need for closer scientific liaison will be emphasised; where dissimilar, there will be the obvious advantage of stimulated discussion.

Realisation of these objectives is made more likely by the staffing of the stands with experts in the various branches of instrumentation illustrated. These helpful French scientists are very ready to compare notes with their British opposite numbers, and such an experience should be valuable to both parties.

Four French Government research organisations are directly represented by stands at the exhibition. The first of these is the Centre National de la Recherche Scientifique, which appears to fill a position in France similar to that held by D.S.I.R. here. L'Office National d'Etudes et des Recherches Aeronautiques has an obvious task, as also the Atomic Energy Commission. Finally, there is the Institut du Petrole. French firms of instrument makers have also co-operated.

Electricity and Magnetism

Although most stands at the exhibition show plenty of electrical, and especially electronic, instruments, there is a section given over to such devices. Notable here was an eccentrically mounted camera for use with c.r.o. tube when curves with polar coordinates are to be recorded. The spot on the screen travels on a fixed diameter, while the camera itself revolves. This device permits the use of the full screen diameter, rather than only the radius.

Oscillators on view include a two thyratron square wave instrument which produces pulses of controllable frequency and shape. The oscillator, which has particular applications to the study of ear sensitivity, uses thyratrons switched by negative transients applied to the grid. Another oscillator uses a pentode to give very low and particularly stable frequencies in the 1 to 30 c/s range. It is useful in the study of response curves of amplifiers used in electro-medical work.

Magnetic studies are represented by a permeameter and an apparatus for the determination of the Curie point. The former can normally deal with magnetic materials at frequencies up to 20 Mc/s, and can handle frequencies as high as 60 Mc/s if specially required to do so.

Particular interest for experimental work attaches to some electrostatic generators shown. Measuring only about 20 in. long by 6 in. diameter, these hand driven instruments can develop 70 kV, with an output of 120 μA. The dielectric used is an air-nitrogen mixture at 25 atmospheres pressure, which is inserted at the factory.

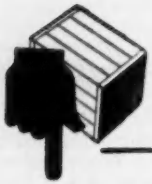
Thin plates between $\frac{1}{16}$ and $\frac{1}{4}$ in. thick are used, and field intensities of 1,500 to 2,000 e.s.u. are obtained. The polarity of the machine is controlled by a neon lamp, and can readily be changed by the operator. Insensitive to atmospheric conditions such as humidity and temperature, the machines are robustly constructed and can be short circuited and exposed to overvoltages without damage.

Aeronautical Research

The many instruments shown in connection with aeronautical research include several devices incorporating magnets. A "pariometer," for instance, measures the thickness of non-magnetic materials when they are inaccessible to normal measuring instruments by applying to one side a small magnet whose field strength falls off rapidly and non-linearly with distance. A differential magnetometer measures the gradient at the other side of the part under investigation, and thus permits the thickness to be determined. Unaffected by the earth's magnetism, this instrument can be used on thicknesses up to 50 mm.

Eddy current induction is applied in instruments used to detect cracks and to determine hardness. In the first, internal flaws in the material examined cause unbalance in a bridge circuit, which can be shown on a c.r.o. screen. The other meter, known as a durometer, effectively measures the conductivity of the test specimen to be determined. This parameter is for a non-magnetic alloy directly related to the hardness.

This brief review only covers a few of the electrical instruments on show, and in addition to these many other branches of instrumentation are well represented, particularly optical devices. A bilingual catalogue of the exhibition is available, price 2s. 6d., giving fuller information about the exhibits and the organisations concerned in the project. Study of the catalogue, followed by a visit to the exhibition, should be stimulating and well worth while for anyone interested in the trends of instrument development.



THE BUYER'S COLUMN

Clem Travelling Iron now available for Universal Voltage Ranges

MAKING it even more useful, the "Clem" travelling iron has now been redesigned to permit instantaneous voltage adjustment. The familiar lines of this little iron have been retained and the new voltage change switch has been built into the top cover, making it easily accessible. Its retail price is 29s. 6d., but it is supplied only to the wholesale trade by the manufacturers, A. B. Metal Products, Ltd., Ludgate House, 107 Fleet St., London E.C.4.

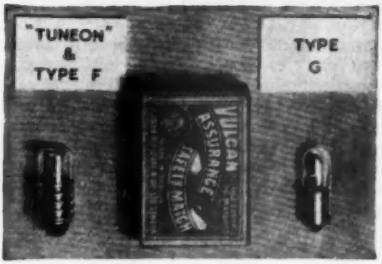
A Washer for the Smaller Home

LATEST introduction by the House of Fisher is the "Washette", baby sister to the famous Fisher washing machines. Designed for the smaller home, the "Washette" is a labour saver, within the reach of every home. Washing time is the same as in the larger units.

The "Washette" going into action

Built in three sections, the "Washette" can be easily stowed away. With a capacity of four gallons of water, the machine will take up to 3 lb (dry) clothes. It measures 2 ft 6½ in. high and 16 in. diameter. The top cover houses the motor and gear box. This rests on the tub fitted with the agitator whilst as an optional addition is the stand which houses a rinsing bowl.

The "Washette" with its streamlined appearance, embodies several ideas hitherto unknown in the washing machine world. It is supplied finished in cream, stove enamelled, by the makers, H. Fisher (Oldham), Ltd., of Glodwick Road, Oldham, Lancs. The price is £16, plus P. Tax.



Miniature Neon Indicators

NOW being marketed by the General Electric Co. Ltd., Magnet House, Kingsway, W.C.2, is a range of miniature neon indicators for use chiefly as visual indicators for electrical circuits. These indicators take up very little room, as can be judged from the illustration, and their negligible power consumption makes them ideal for use in nearly every pattern or type of electrical equipment. They operate from 200-250 V supply with an external resistance of 0·25-0·5 mΩ in series.

Types F and G are for a.c. supply, nominal operating current is 0·5 mA and 0·15 mA respectively. Caps and prices are s.e.s, 4s. 6d., and s.b.c. centre contact, 3s. 6d., again respectively. The "Tuneon" is for d.c. supply, operating current is 0·5 mA. With s.e.s. cap the price is 4s. 6d.

New Meter by B.I.C.C./Ferranti

AS we go to press, we learn that a new type single-phase meter type F.M. has been introduced by British Insulated Callender's Cables. Described as the result of joint research and development between Ferranti Ltd. and the Company, the meter is now in production and as soon as details are available, these will be published.

Low Voltage Transformers

FOLLOWING on a note which appeared in our issue of February 2, page 167, under the heading "Portable Transformer," and which described a home-made portable transformer constructed by the correspondent "F.R.S.," we hear from Gresham Transformers Ltd., of Twickenham Road, Hanworth, Middlesex, that they produce large numbers of low-voltage transformers in a standard range, including units which are almost identical with that described.

A Modern Miniature Circuit-Breaker

THE miniature single pole circuit-breaker, type S.121, made by Siemens-Schuckert (Great Britain) Ltd., Gt. West Road, Brentford, Middx., affords full protection to direct and single-phase alternating current motors and apparatus having a current consumption of up to 30 amp at 250 V. It is the single pole form of the well known triple pole C.D. type, S.12 III, and is built for a range of current ratings of 5, 10, 15, 20, 25 and 30 amp.

The miniature c.b. by Siemens-Schuckert

It incorporates several interesting features, especially the provision of a neutral link which is operated automatically by the action of the main contacts. The contacts of the neutral link are closed before and opened after the main contacts, thus they never make or break on-load. Like its triple pole counterpart, the circuit-breaker incorporates both an instantaneous magnetic short circuit release which also operates on an overload of seven to eight times the rated current, and a bi-metal time lag release with inverse characteristic. Starting from cold, it allows an overload of 50% for 2 min and 100% for 30 sec approximately. After interruption, current may be restored as in the case of the magnetic short circuit trip, by means of the handle. The main contacts are of very liberal dimensions. Their useful life being further increased by magnetic blow-out coils and efficient unbreakable arcing shields.

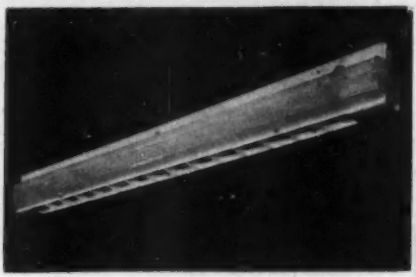
The cover and base of the circuit-breaker are black, the operating handles having a different colour for each current rating. Base measurements are 4⅝ in. high and 1½ in. wide.

Electric Clock Controls Appliances

IN our issue of February 2, under this heading, we noted that the "Sectric" pre-set clock made by Smiths English Clocks Ltd., Sectric House, Waterloo Road, London N.W.2, could control the operation of an electric cooker. We are now informed that this is not so, although other appliances can be controlled by the clock.

Fittings by Philips

PHILIPS ELECTRICAL, LTD., of Century House, Shaftesbury Avenue, London W.C.2, have just introduced a new range of fluorescent fittings. Examples from this range are: The "Apsley," Cat. A.6060, designed for shops, showrooms, etc., which is a single lamp 80 W "Perspex" panelled louvre diffused fitting, list price £25 11s. 8d. (inc. P.T.). The "Westbury," a semi-



The Apsley fitting by Philips Electrical

indirect pendant fitting especially designed for 160 W and 250 W Philips blended lamps or 200 W and 300 W tungsten lamps; the bowl and suspension are finished cream with grey louvre and polished aluminium bands and list prices E.8538, (200 W) £9 (inc. P.T.), W.8539 (300 W) £9 2s. 6d. and the "Axminster", A.6003, an open-end detachable reflector fitting for 80 W lamps.

Straight to the Point

IMPROVED heavy duty tumbler switches are announced by Arrow Electric Switches, Ltd. of Hanger Lane, Ealing, London W.5.

Something new in the presentation of specifications, the folder illustrates ten of the new switches in fully dimensioned photographs. These switches are of the quick make-and-break variety, suitable for 30 amp, 250 V and 20 amp, 600 V in the double pole, triple pole, four pole, single and double pole change over types and for 60 amp, 250 V and 30 amp, 600 V double pole type. They are available for panel mounting or in pressed steel boxes for surface mounting. The performance of these precision built switches is due partly to such factors as (a) Bakelite arc snuffers which reduce the arc and increase breaking capacity; (b) kick-off release which mechanically starts the switch blades in motion and removes the possibility of sticking; (c) extra-heavy switch blades and contact jaws to increase current carrying capacity. They are easy to wire because of special "Tight-Grip" terminals.

TRADE PUBLICATIONS

HOTEL ROOM RADIO. Radio in your hotel room by prepayment coin box is possible with the new Communication Systems, Ltd. service. A new leaflet describes this scheme.

PROJECTOR LAMPS. Catalogue OS (2) section by General Electric Co., Ltd., lists and illustrates "Osram" gasfilled projector lamps.

THE WEEK IN NEWS

The Door to Dollar Sales

"ALTHOUGH the obstacles to be overcome in the North American market are great, the potentialities are vast," comments a Dollar Exports Board booklet, *Dollar Sales — Consumer Goods*, just published, price 2s. 6d. It points out that the average annual buying income of an American is about £450; of a Canadian about £260 —and both countries are still expanding. Many of the handicaps which British exporters to the dollar markets experienced pre-war have been removed or reduced; American tariffs are now one-third of what they were under the 1930 Hawley Smoot Tariff Act, and customs procedure is gradually being simplified.

The booklet sets forth the general principles which govern successful distribution and marketing of consumer goods. Two chapters are devoted to questions raised by newcomers to the market and planning for an increasing volume of sales. The third chapter gives practical suggestions of distribution channels and a short section on advertising and selling explains the "follow-up" action manufacturers should take. The use of effective and forceful sales promotion is being dealt with in a separate booklet. A further booklet containing a more specialised reference to capital equipment and supplies for the industrial buyer is to be issued shortly. Address of D.E.B. is Thames House, Millbank, S.W.1.

B.E.A. and Increased Canal Charges

AT the hearing before the Transport Tribunal into the British Transport Commission's application for increased dock and canal charges on Wednesday of last week, Mr. E. S. Fay, on behalf of the British Electricity Authority, submitted that toll charges should not be raised by the same amount as other rates. The canals, he declared, had been losing traffic for many years, and an attempt should be made to regain this loss, if need be by reducing the scale of tolls. He asked that, if this plea could not be granted, a differential rate should be given to coal traffic on canals.

Amendments to Form of Sub-Contract

RECENT negotiations between the National Federation of Building Trades Employers and the Federation of Associations of Specialists and Sub-contractors (of which E.C.A. is a member) have resulted in the ratification of certain amendments to the revised standard form of sub-contract. In Clause 3 (b) the words "except as regards loss or damage by fire" is deleted, thereby indemnifying the main contractor in respect of third party fire risks arising from a sub-contractor's negligence or breach of duty. In Clause 23, dealing with fluctuations in prices of materials, the words "if after the date of this sub-contract" are substituted for "if during the progress of the sub-contract works." Copies of the revised document will shortly be available from the Electrical Contractors' Association, Africa House, Kingsway, W.C., price 1s. 6d. each.

166 Salesmen Pass E.D.A. Exam.

RESULTS of the examinations held after the E.D.A. salesmanship training course show that 166 candidates have been awarded the E.D.A. Domestic Electricity Salesmanship Certificate.

Eight candidates passed "with distinction." They were:—

Mr. T. H. B. Moore, West Ham district, N.E. sub-area, London Board; Mr. A. H. Knowlden, Purley district, Croydon and West Kent sub-area, S.E. Board; Miss H. F. Gillespie, Kingston district, Surrey sub-area, S.E. Board; Mr. G. DeC. Rolls, Brentwood district, Essex sub-area, Eastern Board; Mr. H. Turner, Stoke district, N. Staffs sub-area, Midlands Board; Mr. R. J. Furlond, Hoylake district, No. 3 sub-area, Merseyside and N. Wales Board; Mr. J. Hilton, Thornton Cleveleys district, No. 4 sub-area, N.W. Board; and Mr. J. Pemberton, Blackburn district, No. 5 sub-area, N.W. Board.

"Quality" Theme of I.M.E. Congress

FEWER papers are to be read at the Third International Mechanical Engineering Congress to be held from September 18-23 in Brussels. Theme of this year's conference will be "Quality." When the organising committee met recently it was decided that more time should be devoted to visiting works in the neighbourhood of Brussels and Antwerp. Full information and application forms will be available at a later date from the British Engineers' Association, 32 Victoria Street, S.W.1.

The First Half Century

Mr. Sellon read a paper on the standardisation of electrical engineering plant, which pointed out that standardisation was the readiest way of meeting foreign competition by facilitating cheap production and repetition work. The gauntlet was thrown down to consulting engineers, who seem to be regarded as the chief obstacle to such standardisation, and who, if removable, ought themselves to be standardised. A hint was thrown out that the Uniformity Committee of the Institution needs the spur, and tabular statements of pressures, periodicities, etc., in our central stations afforded some of the debaters a chance of winging the shafts they aimed at the reader with feathers from his own pinions. The general tone of the debate, however, was one of agreement with the paper.—*From our issue of February* 15, 1900.

This huge mural, 252 ft long and 16 ft high, at the Gestetner Works, Fawley Road, N.17, is floodlit each week night by thirteen Osram 1,000-watt "Horizon" lamps. Scenes show writers throughout the ages

E.D.A. Speakers for National Final

NATIONAL finals of the E.D.A. public speaking competition will be held at the Lighting Service Bureau, 2 Savoy Hill, W.C.2, on Thursday, April 20. There will be seven competitors in the women's section—first-prize winners in seven area contests—and three men finalists. On this occasion the national winners will be presented with the new Faraday Challenge Shields and a small inscribed plaque.

Results of the various area contests so far held are:—

WOMEN'S SECTION

Eastern Area: 1, Miss M. G. Leeming, Northmet sub-area; 2, Mrs. W. E. Ward, Northmet sub-area, Eastern Board.

N.W. Area: 1, Mrs. M. Alcorn, No. 1 sub-area; 2, Miss J. Keggan, No. 7 sub-area; 3, Miss E. Moore, No. 1 sub-area, N.W. Board.

S.E. and S.W. Scotland Areas: 1, Mrs. W. L. Smith, Glasgow sub-area; 2, Miss A. J. Bryce, Glasgow sub-area, S.W. Scotland Board.

Southern, S. Wales, and S.W. Areas: 1, Miss M. T. Cooke, No. 2 (Newbury) sub-area, Southern Board; 2, Miss Farett, No. 3 (Exeter and East Devon) sub-area, S.W. Board.

Yorkshire Area: 1, Miss L. M. Kaye, No. 3 (Sheffield) sub-area; 2, Miss B. M. Ramsden, No. 5 (Wakefield) sub-area, Yorkshire Board.

Results have still to be received from contests in Merseyside and N. Wales area and N.E. area.

MEN'S SECTION

S.E. and S.W. Scotland Areas: 1, Mr. D. Cameron, Southern sub-area, S.E. Scotland Board; 2, Mr. A. S. McConnell, Lanarkshire sub-area, S.W. Scotland Board.

Southern and S. Wales Areas: 1, Mr. D. B. Garwood, Headquarters, S. Wales Board; 2, Mr. D. Lucey, Eastern sub-area, S. Wales Board.

A competition for men is also being held in N.E. area.

Ship's "Eyes" Demonstrated

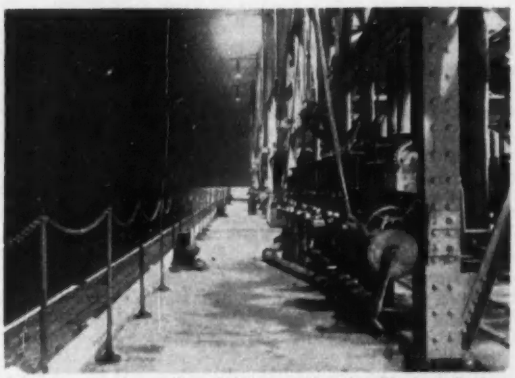
SMALL craft and river traffic on the Mersey are shown in great detail on a ship's radar equipment now being demonstrated at Woodside landing stage, Birkenhead, by the Decca Navigator Co., Ltd. Decca marine radar was first introduced last autumn after more than three years research and development. Priced at £1,500 complete, it is claimed to have unique features and to be the world's lowest priced ship's radar. A large number of orders have already been received for the equipment, both for home and foreign vessels, and it is now being fitted at the rate of more than one ship a day.

German Exports "Handicapped"

"GERMAN efforts to export are subject to many handicaps," concludes a booklet entitled "Western Germany," just published by the British Engineers Association, price 2s. post free. The authors, Mr. C. F. I. Ramsden, overseas director, Federation of British Industries, and Mr. A. W. Berry, director, British Engineers Association, review present problems facing German productivity. Some of the principal factors mentioned are: wretched housing conditions, a shortage of heavy machinery and insufficient finance to re-equip, heavy taxation and lack of governmental incentive to export. On the other hand, labour is cheaper and more amenable to progressive changes than that in U.K., considerably longer hours are worked, and unions do not press for restrictive practices.

Flameproof Lighting for Oil Jetty

PETROLEUM products necessitate careful handling, and because of increased tanker traffic on all tides Shell-Mex and B.P. Ltd. have

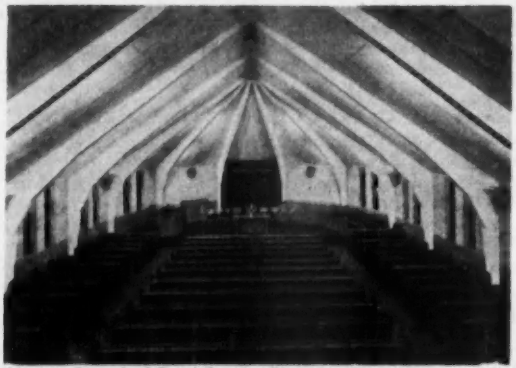


Night scene of new floodlighting at the Hamble installation jetty No. 2 of Shell-Mex and B.P. Ltd.

installed a new floodlighting system at their Hamble installation jetty No. 2. Block floodlighting incorporates eleven 500-watt G.E.C. Z.F.16531 certified flameproof lighting units mounted 28 ft above the jetty, 40 ft apart. The scheme has been designed to provide illumination 30 or 40 ft beyond the jetty edges. Particular attention has been paid to lighting points where men leave ladders or staging to transfer to craft.

Although this type of unit was originally intended for use in mines, by making it in alloy the weight has been cut by half. Lighting standards on the jetty were made by Hamble installation staff, and the electrical construction was undertaken by Troup Curtis and Co. in co-operation with G.E.C.

So that the intensity of the floodlighting did not seriously affect operating staff arriving and leaving the jetty the approach lighting was specially arranged by Revo Electric Company, with flameproof fittings by Walsall Conduits Ltd. Raising and lowering equipment was supplied by London Electric Firm. In event of an interruption of supply a standby generator provides power for navigation lights.



Above: Greenleaf Road Baptist Church. Does fluorescent lighting in a church result in any loss of beauty? These two photographs of different installations show that fluorescents can attractively light both old and new churches without loss of atmosphere. Below: St. James's Church, Leyland

Vertical Fluorescents Enhance Line

IN order to conform to the architectural line, fluorescent tube fittings at St. James's Church, Leyland, were set vertically. The complete installation consists of 12 twin-tube 40-watt Sieray fittings with "Perspex" diffusers. Reflector spotlamps light the chancel from concealed positions behind ceiling beams. The tubes themselves are "warm white" and the contour of the diffuser was designed to repeat the pattern of the octagonal column, whilst the frame-work of the fitting, in oak, harmonises with the pulpit and stalls. The electrical installation was carried out by N.W. Board, fittings being specially designed by Siemens Electric Lamps and Supplies, Ltd.

Eastbourne Wants Tenders for Wiring

BY a majority of 21 votes to 11 Eastbourne town council decided that tenders should be submitted for re-wiring the town hall. South-Eastern Board engineers, who submitted a detailed report on the present state of the wiring, estimated the cost of replacement at £3,000. The council's finance and general purposes committee recommended provision for half the cost in next year's estimates and suggested that the Board should do the work. Accordingly, the committee proposed that standing orders requiring advertising of contracts worth more than £500 be suspended.

The full council did not agree with this proposal. Instead, an amendment was carried that tenders should be asked for so that local electrical engineers would be able to compete.

Latest Lighting for New Church

AS our photograph shows, a highly effective fluorescent lighting scheme was recently installed in the new Baptist church at Greenleaf Road, Walthamstow, E.17. Planned by Cowlans, electrical engineers and contractors, the installation utilises twenty-eight 5 ft G.E.C. Channel type fittings with mellow tubes. Instant starters are fitted behind the trusses. The original church was destroyed by enemy action in 1945, and Greenleaf Road is the first Baptist church to be rebuilt in London.

Telcon Long Service Presentations

LONG-SERVICE certificates were presented to 30 members of the staff of The Telegraph Construction and Maintenance Co., Ltd., at the 16th annual presentation concert of Telcon social and athletic club. Mr. J. N. Dean made the presentations together with awards in the form of cheques to students who had been successful in examinations. The Mayoress of Greenwich, Mrs. George Bruce, presented cups and trophies for

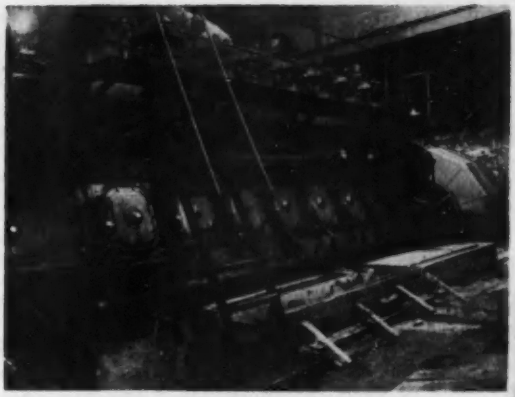
indoor and outdoor games. Among those present were: Mr. F. Leighton, works manager and president of the club, Messrs. B. H. Musgrave and W. F. Randall, directors, and Dr. E. W. Smith, director of Submarine Cables, Ltd.

All-Electric Age

THE genius and enterprise of engineers would play a notable part in Britain's recovery, Professor E. B. Moullin, president, I.E.E., told guests at the jubilee dinner of the Scottish centre of the Institution in Glasgow. Professor Gilbert Cook, president of the Institute of Engineers and Shipbuilders in Scotland, said that by the time the all-electric age did arrive the human being—provided he had not already been transmuted by some kind of atomic bomb—would have become so atrophied to the removal of all necessity for effort that he would not even be able to press the button provided for the opening of the door to everlasting bliss.

Lift Workers' Pay Increase

THE National Arbitration Tribunal has awarded a special bonus of 2d. per hour for skilled workers and 1d. per hour for improvers employed on the erection, repair and maintenance of lifts, with effect from the first full pay period following February 3, 1950. This bonus is to be subject to overtime, holiday and other premium payments.



One of ten ordered by N. Scotland H.E. Board, this 100 kW diesel generator set, built by British Polar Engines, is now supplying power to Dunoon

NEWS IN BRIEF

An exhibition of Bakelite, Warerite and Vybak plastics will be held in the Exhibition Rooms of the British Colour Council at 13 Portman Square, London W.1, from March 9 to 17. (Hours of opening: 10 to 6, Mondays to Fridays only.) Admission will be by ticket from Bakelite Limited.

In our article last week describing the Cossipore power station, we stated that this would add "100 MW to Pakistan resources." This, of course, should have read "110 MW to Indian resources."

CASES IN COURT

Payment of Stopped Cheque

AN unusual case occurred at Brentwood County Court recently when Lloyds Bank Ltd. claimed from H. W. Field and Son Ltd., of Harold Wood, for the recovery of £100 paid to meet a cheque for that amount presented at one of their branches and which was subsequently dishonoured. The plaintiff's case was that Mr. Rutter Harbott, of Rutter Harbott Brothers and the Tower Engineering Co., cashed a cheque for £100 drawn in his favour by H. W. Field and Son. A bank official, after consultation, permitted him to pay the amount into Rutter Harbott Brothers' account and draw on the Tower Engineering Co.'s account, in order to pay employees' wages. Subsequently, H. W. Field and Son notified that they were not prepared to honour the cheque. Mr. E. G. Green, a director of H. W. Field, said Harbott had told him on July 10, 1948, that goods worth £100 would be delivered the following morning. On the strength of that promise he gave him the cheque, but the goods failed to arrive. Drawing our attention to this case, H. W. Field and Son stress the warning that if a cheque is stopped in good faith, owing to a broken contract, it did not follow that it would not be paid. If the payee presents it, and is immediately paid, the bank had the apparent right to sue the drawer for its recovery. In this case, H. W. Field and Son were called upon to pay £100 for goods never received, they state.

Claim for Damages Dismissed

THE claim for special damages of £372 against the Eastern Electricity Board by Mr. C. M. Alcock, an electrical fitter employed by the former Ipswich Corporation Electricity undertaking, who was stated to have had a "miraculous" escape from death when, on October 15, 1946, he touched apparatus carrying 11 kV, was dismissed by Mr. Justice Stable at the Norfolk Assize Court recently. For the plaintiff it was stated that he was required to work in a kiosk supplied from an adjoining transformer and two substations. He waited for notification that all supplies were cut off, and from the sequence of events concluded that that had been done, but he was unable to contact the district engineer, who was out switching off power. Starting to work, he came in contact with live apparatus, suffering various injuries.

ELECTRIC SUPPLY NEWS

Dudley

In connection with the Council's proposed scheme for the provision of electricity to 1,500 council houses, a letter has been received from the National Register of Electrical Installation Contractors pointing out that the scheme made no mention of the Certificate Holders on the National Register being permitted to tender for this work, and asking that they should be given recognition and allowed to tender. A letter from Midland Electrics, of Stechford, also pointed out that they held approximately 150 to 200 signed contracts to instal electric lighting in certain council houses, and were retaining the initial payments made by the tenants concerned. They asked the Council to allow them to carry out this work. The Housing Committee has resolved that the borough architect should prepare the necessary specification, and that tenders be invited for the work in sections. It is proposed that the secretary of the N.R.E.I.C. be asked for a list to be supplied of members in Dudley and district, and that, subject to further consideration being given to members on the National Register, the Council adhere to the previous decision that only tenders from the Midlands Electricity Board and those firms who are members of the E.C.A. be considered for the work. The committee suggest that a letter be sent to the Midland Electrics strongly disapproving their intention to hold the deposits, and pointing out that a firm had no right to enter into contracts with tenants, without obtaining the consent of the Corporation as landlords, and that the Town Clerk be authorised to take such action thereon as may be necessary to protect the interests of the Corporation.

Nottingham

Presenting the report of the County Planning Committee the chairman said the committee had approved the proposal for an overhead power line from Staythorpe to West Melton, near Sheffield. The route had been selected to avoid the Dukeries area. He said the committee was absolutely satisfied that there could be no reasonable ground for suggesting any alternative route. "We had got rather used to seeing pylons; they did not upset the view," he commented.

Stanley (Co. Durham)

The Urban Council has received a schedule of new street lighting charges from the North-Eastern Electricity Board. Although the proposed charges, amounting to £2,228 per annum, are a reduction on last year's figures, the Council has been informed that the rates are in excess of those fixed by the Eastern Electricity Board. The Council has asked the North-Eastern Board why its charges are above those of the Eastern Board.

Slough

A new bulk supply point is to be established in Slough, at the site of the old generating station at Chalney. It is expected that it will be completed within about two years.

Southport

The Corporation has been told by the Merseyside and North Wales Electricity Board that, owing to the existing economic conditions and the restrictions on capital expenditure, the Board is unable, for the time being, to proceed with the provision of a supply to 220 houses on the Central Avenue and Guildford Road housing estates. The Corporation proposed to approach the Minister of Health, urging that the Board be pressed to provide the supply without delay.

Stockport

An electrical fault caused the windings of a 30,000 kW turbo-alternator to burn out at the Millgate power station last week, causing a temporary cessation of some local supplies.

Tees-side

At the recent meeting of the Tees-side Industrial Development Board, concern was expressed at what was considered the slow rate at which the amount of electricity available for Tees-side industry was being increased. It was felt that unless extra power was available before next winter, there would be a serious loss of industrial production. For the North Eastern Electricity Board, it was explained that 120 MW of generating capacity was in process of installation at North Tees "C" power station, and that a scheme for a further extension of 120 MW was in hand. The first two 60 MW sets, however, would not be in commission till the winter of 1950-51, followed in 1952 by the third set and the fourth in 1953.

LIGHTING SCHEMES

Abergavenny.—The Town Council has approved a scheme for lighting the town by electricity.

Brighouse.—It is proposed that the present gas lighting of the full length of the Bradford-Huddersfield main road in the borough should be changed to mercury vapour.

Coventry.—The M.o.T. has intimated that the Ministry would be prepared to give sympathetic consideration to an experimental scheme for lighting Broadgate, and where practicable, new housing estates, without the use of lamp standards.

Haslingden.—Application is to be made to borrow £2,750 for improved lighting of Manchester Road from Road End to the Ewood Bridge boundary.

Hinkley.—The town is to try out experimental electric street lighting.

Kingston-upon-Thames.—It is proposed to use 400 W lamps in connection with the first phase of the town centre lighting.

Lisburn.—The first completed section of the town's new £28,000 lighting scheme was tested last week. The class "A" lighting on the main

thoroughfare is by fluorescent lanterns on concrete standards 25 ft high, and the class "B" on the other streets and roads by lamps on concrete standards 15 ft high. In all, there are 167 class "A" lamps and over 300 for class "B" lighting. Completion of the scheme is expected in April next.

Loughborough.—The Corporation has decided that electric street lighting shall be installed in Nottingham Road, Baxter Gate, Pinfold Gate, Wood Gate, Market Street, Church Gate, Meadow Lane, Clarence Street and Ashby Road.

Southend-on-Sea.—The Corporation has accepted the Eastern Electricity Board's estimate of £12,780 for lighting the sea front, cliffs and gardens during next summer, providing satisfactory arrangements can be made.

Torquay.—The Council has approved the recommendation of a special committee to implement an amended scheme, extending the present illuminations on the front, at a cost of £6,505.

COMPANY ACTIVITIES

Calcutta Electric Supply Corpn. Ltd.

The list opened and closed on Tuesday last, for applications for the £3,000,000 of 5% Debenture Stock, 1970, offered at £98 per £100 by the underwriters, Lazard Brothers, at the same time and on the same terms, Rs 2,66,00,000 (approximately £2,000,000) of similar stock will be offered in India. The offer met with a very poor response, the underwriters being called upon to take up 85% of the stock. In Bombay, however, the local investors over-subscribed for the stock offered.

Electrical & Industrial Investment

Investment income for 1949 was £85,568 (*£79,920*), plus interest nil (*£74*), sundry receipts £376 (*£628*), making £85,944 (*£80,622*). To general expenses £2,456 (*£2,274*), directors' fees £1,500 (*same*), tax £32,456 (*£30,907*), debenture interest £8,000 (*same*), interest £2,379 (*£1,511*), leaving net profit of £39,153 (*£36,430*). Preference dividend takes £3,300, Preferred Ordinary £3,850, Deferred Ordinary 20% £11,000 (*all same*), leaving £21,003 (*£18,280*) carried forward. Current assets are listed at £47,136 (*£16,636*), current liabilities £18,685 (*£17,382*). Investments £744,321 (*£802,515*), including £133,047 (*£126,171*) in associated companies.

International Combustion (Africa) Ltd.

The machine shop and foundry constructed at Port Elizabeth have successfully commenced operations, Sir George Usher stated at this meeting, the company holding the distinction of being the first capable of manufacturing heavy boiler plant and combustion equipment in that country. At present, orders on the books amount to nearly £4 million, and included some large export orders.

Sterling Electric Holdings Ltd.

For the year ended March 31, last, group trading profit amounted to £88,130 (*£60,469*), plus interest, etc., £84 (*£88*), surplus on sales of properties, less provision for former group companies' debts, £21,748 (*£30,503*), making £109,962 (*£91,314*). To directors' emoluments £9,807 (*£8,748*), audit fee £2,583 (*£1,684*), mortgage and bank interest £11,091 (*£13,303*), and depreciation of fixed assets £29,090 (*£24,714*), leaving a net profit of £57,391 (*£42,865*). With £45,834 (*£16,635*) brought in, and £1,679 (*nil*) deferred repairs written back, there is £104,904 (*£67,855*) available. To tax £19,352 (*£15,241*), Funding Certificate interest £1,380 (*£705*), Funding Certificate redemption £2,621 (*£2,500*), Preference dividend £7,150 (*£3,575*), leaving £74,401 (*£45,834*) carried forward. Current assets are listed at £481,945 (*£392,503*) and current liabilities at £314,802 (*£302,442*). On the electrical, industrial and domestic appliance side, the chairman states every effort is being made to reduce costs, and new lines are being introduced. Nevertheless, he expects the results for the next year will reflect the restriction of import imposed by the South African Government and the tardiness of the Argentine Government to implement its obligations under the recent trade agreement.

Westinghouse Brake & Signal Co.

For the year ended October 1 last, group trading profit amounted to £491,213 (*£467,601 for previous 53 weeks*), after allowing depreciation provision of £110,393 (*£98,864*). Interest on loan and bank overdrafts absorbs £27,850 (*£11,769*), and taxation £238,935 (*£220,892*). Profits attributable to minority interests are £9,948 (*£15,830*) and retained by subsidiaries £42,548 (*£68,139*), leaving a net profit for the parent company of £171,932 (*£162,740*), plus adjustments relating to earlier years £10,039 (*£7,417*) and with £99,103 (*£93,680*) brought in, there is £281,074 (*£263,837*) available. Dividend of the parent company is again 14%. Transferred to capital reserve for replacement of plant and equipment £20,000 (*£55,000*), to reserve for contingencies £25,000 (*£23,311*), to reserve for staff pensions £5,000 (*nil*), and to reserve in respect of the temporary benefit of initial allowances for taxation £45,000 (*nil*). Dividend absorbs £86,423, leaving £99,651 carried forward.

Dividends Declared

M. Mole & Son.—Dividend of 10% (*20% plus 5% bonus*). Net profit for 1949 £7,755 (*£13,716*), plus £1,756 E.P.T. refund and taxation reserve not now required, making £9,511.

Electrical Components Ltd.—Interim dividend of 7½%, payable on March 10. (This compares with a dividend of 3½d. per 5s. share for the nine months ended March 31, 1949.)

Commercial Information

CONTRACTS OPEN

*The date stated is the last day for receiving tenders. Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House North, Millbank, London S.W.1, quoting reference number.*

February 17.—Belfast T.C.—Supply and delivery of a loud-speaking telephone installation. J. Dunlop, Town Clerk, City Hall, Belfast. Deposit £1 1s. Advertised in February 2 issue.

February 18.—Armagh.—Electrical work at Lurgan Maternity and Child Welfare Centre, for County Health Committee. Architects, Houston and Beaumont, 6 Union Street, Lurgan. Deposit £2 2s.

February 18.—Cork C.C.—Electricity installations in 40 houses being erected at Butterant. Secretary, Shortcastle, Mallow.

February 18.—Egypt.—Supply of electrical switchgear delivered into store at Cairo. Director-General, Cairo Electricity and Gas Administration, 53 Fouad El Awal Street, Cairo, Egypt. Specifications from Chief Inspecting Engineer, Egyptian Government, 41 Tothill Street, S.W.1. Remittance £2 1s. per set, non-returnable.

February 18.—Felling U.D.C.—Electric wiring, fittings and equipment in 70 houses. D. W. Green, Housing Architect, Council Buildings, Felling, Gateshead 10.

February 18.—Rickmansworth U.D.C.—Electric light and power installation in 61 houses on housing estates at Croxley Green, Mill End and Maple Cross. Housing manager, Council offices, Rickmansworth. Deposit £2 2s.

February 18.—Sandown-Shanklin U.D.C.—Supply of amplification equipment, for installation in Concert Pavilion, Sandown Pier. Entertainments Manager, The Pavilion, Sandown.

February 19.—Persia.—Power plant for sugar beet factory. Sugar Industrial Commission, Seven Year Plan Organisation, Bank Sanati, Tehran. B.o.T. (Ref. C.R.E. (IB) 31741/49).*

February 20.—Aberdeen C.C.—Electrical work for 8 houses at Braemar, 8 at Tipperty, 6 at Colpy, 6 at Drumblade, 8 at Auchnagatt and 6 at Longhaven. County Architect's office, County Buildings, 25 Union Terrace, Aberdeen.

February 20.—Poole T.C.—Electrical installations in 264 houses in process of erection at Wallisdown estate, Wallisdown, and 92 houses at Alder Farm estate, Alder Road. Borough Engineer, Municipal Buildings, Poole. Deposit £2 2s.

February 20.—Preston T.C.—Electrical installation in 67 houses on Brookfield estate, part 1. Acting Borough Engineer and Surveyor, Municipal Building, Preston. Deposit £2 2s.

February 20.—Maidstone T.C.—Electrical installations for houses on Shepway estate in six contracts: (1) 12 houses; (2) 28 houses; (3) 18 houses; (4) 4 shops with flats over; (5) 20 houses; (6) 12 houses. Borough Surveyor, Palace Avenue, Maidstone.

February 21.—Poole T.C.—Twelve months' supply of electric lamp bulbs, cables, fittings, batteries, water heaters and control units, street lighting lanterns, conduit and accessories. J. R. Barron, Borough Engineer and Surveyor, Municipal Buildings, Poole.

February 22.—Belgium.—100 loudspeakers complete with transformers. Belgian State Railways. B.o.T. (Ref. CRE (IB) 42823/50).*

February 22.—Belgium.—Equipment for electro-mechanical signalling systems. Belgian State Railways. B.o.T. (Ref. CRE (IB) 42568/50).*

February 22.—Belgium.—Twenty-four lots of cables of various types. La Societe Nationale des Chemins de Fer Belge, Direction du Materiel et des Achats Bureau, 26-41 Rue aux Laines, Bruxelles. B.o.T. (Ref. CRE (IB) 42036/50).*

February 22.—South Africa.—Supply of cables for tractors at Table Bay power station. City Electrical Engineer, 3rd Floor, Electricity House, Strand Street, Capetown. B.o.T. (Ref. CRE (IB) 42030/50).*

February 24.—Arbroath.—Electrical work for 30 houses at Cliffburn Road. W. R. Samson, Housing Architect, Olympia Buildings, Market Place, Arbroath.

February 24.—Burnley T.C.—Electrical installations for extensions to Towneley technical high school. Borough Engineer, Town Hall, Burnley. Deposit £1 1s. Advertised in February 9 issue.

February 24.—Horwich U.D.C.—Twelve months' supply of electric lamps. J. Seddon, Clerk of the Council, Council Offices, Horwich, Lancs.

February 25.—Bath Hospital Management Committee.—Conversion of electric lighting, heating and power installations from d.c. to a.c. at Winsley Sanatorium, Limpley Stoke, near Bath. J. Lawrence Mears, secretary, Bath Hospital Management Committee, Manor Hospital, Combe Park, Bath. Deposit £3 3s.

February 25.—Evesham T.C.—Supply and erection of 34 high pressure sodium electric discharge street lighting lamps on Bath-Evesham-Lincoln trunk road. N. F. Davies, Town Clerk, 3 Leicester Gables, High Street, Evesham. Advertised in Jan. 19 issue.

February 25.—Meath C.C.—Automatic emergency lighting system for use with existing theatre lighting unit at Our Lady's Hospital, An Uaimh. County Engineer's office, County Hall, Navan.

February 25.—Tynemouth T.C.—Year's supply of electric lamps, lamp columns and cable. Borough Surveyor, 19-20 Howard Street, North Shields.

February 27.—Lochgelly T.C.—Electrical work for 32 houses to be erected at Cooper Ha' Park housing scheme. Architect, Alexander Watson, 24 Queen Anne Street, Dunfermline.

February 27.—Runcorn U.D.C.—Twelve months' supply of electric lamps. Engineer and Surveyor Town Hall, Runcorn.

February 27.—Cuckfield R.D.C.—Installation of electricity in houses at (1) Keymer; (2) Hassocks; (3) Hurstpierpoint; (4) Anstye; (5) Warninglid;

(6) Slough Green; (7) Balcombe; (8) Ardingley; (9) Poynings; (10) Twineham; (11) Bolney; (12) Sayers Common; (13) Handcross; (14) Pycombe Street; (15) Horsted Keynes; (16) Albourne; (17) West Hoathly; (18) Crawley Down; (19) Copthorne; (20) Pound Hill; (21) Three Bridges. Engineer and Surveyor, A. Hutchings, Rural Council Offices, Boltro Road, Haywards Heath. Deposit 10s. 6d.

February 27.—Uruguay.—One electro pump, 1 diesel generating set and 1 control and distribution board. Administracion Nacional de Combustibles Alchohol y Portland. B.o.T. (Ref. CRE (IB) 42215/50).*

February 28.—Armagh.—Internal P.B.X. telephone and fire alarm system in St. Luke's Hospital. Secretary, Management Committee.

February 28.—India.—Two 3,000 kW turbines with accessory equipment; two a.c. generators, continuous rating output, 3,000 kW; three water tube steam boilers, switchgear and accessories; three 500 kVA 3/3/0/4 kV station transformers. Chairman, Central Electricity Commission, Government of India, "Clevemont," The Mall, Simla 4. B.o.T. (CRE (IB) 37481/49).*

February 28.—Tangier.—Lead cased cables with copper conductors of 6/10 mm section and paper insulation varying from 10-1,200 pairs, and in lengths of 510-4,000 m. 55,000 m lead cased cable with one pair cotton insulated 5/10 mm enamelled copper conductors. Telefonica de Tangier, S.A. B.o.T. (Ref. C.R.E. (IB) 40903/50).*

March 1.—Coulsdon and Purley U.D.C.—Seventy-three single tube and four twin tube fluorescent lighting fittings, Met-Vick type 292034, for council offices. E. F. J. Felix, Clerk of the Council, Council Offices, Purley. Advertised in this issue.

March 1.—India.—One electric trolley bus complete with body, 29 trolley bus chassis, overhead line equipment, rectifier substations, service of personnel for erection of equipment in Bangalore. Mysore Stores Purchases committee. B.o.T. (Ref. CRE (IB) 8279/49).*

March 2.—Australia.—Cooling radiators for power transformers. Specification No. 1353. Deposit £210. 11,000 V, 250 MVA, metal-clad switchgear for Chatswood substation. Specification No. 1346. Deposit £110. Comptroller of Stores, Old Electricity Building, St. Andrews Place.

March 2.—Uruguay.—Three groups of control gears for 3-phase, 2,100 kVA, 6,300 V diesel electric generators. Usinas Electricas y Telefonos del Estado. B.o.T. (Ref. CRE (IB) 42252/50).*

March 4.—Hepton R.D.C.—Pumping plant for Heptonstall water extension. Two sets of pumps, electric motors with automatic control starting gear, etc. Council's Consulting Engineer, A. Brooksbank, 14 The Exchange, Bradford.

March 4.—Irlam U.D.C.—Twelve months supply of electric lamps. Engineer and Surveyor, Council Offices, Irlam, near Manchester.

March 6.—S.Africa.—Eight three-phase, four wire, metal-clad, low tension air break switchboards. Electrical Engineer, Town Council of Boksbury, near Johannesburg.

March 7.—Argentina.—Provision and installation of H.T. cables between San Nicholas and Zarate, comprising approximately 143 km of 66 kW line and accessories. Directorate of Electricity and Mechanics of Ministry of Public Works, Buenos Aires. B.o.T. (CRE (IB) 30675/50).*

March 8.—Mendip Hospital Management Committee.—Twelve months' supply of electrical accessories. M. L. Lowe, secretary, Mendip Hospital Management Committee, Wells, Somerset.

March 9.—Port of Bristol Authority.—Twelve months' supply of electric lamps and sundries. Central Purchasing Dept., 2 Upper York Street, St. Paul's, Bristol 2.

March 10.—British East Africa.—Installation of an automatic internal telephone system in Nairobi Town Hall and proposed City Hall. Municipal Council of Nairobi. B.o.T. (Ref. CRE (IB) 41239/50).*

March 11.—Keighley T.C.—Small electrically driven "booster" pumping plant for waterworks department. G. E. V. Boldry, waterworks engineer, Martins Bank Chambers, Keighley.

March 13.—Argentina.—Electrical pumping equipment, low tension switchboards and venturi meters for the administration at Junin, Buenos Aires. B.o.T. (Ref. CRE (IB) 42990/50).*

March 13.—Lincoln C.C.—Electric lighting and power installation at "Westholme," Sleaford. C. B. Metcalfe, County Architect, County Offices, Sleaford. Applications by February 18.

March 14.—East Lothian Water Board.—Electrically driven surface pumps. Two pumps at 500,000 gal per day each and two at 1,500,000 gal per day each, for Whiteadder Valley pumping station, near Priestlaw. G. H. Hill and Sons, Civil Engineers, 51 Mosley Street, Manchester.

March 16.—Australia.—Two automatic voltage regulators complete with all accessories for regulating alternators No. 15 and 16 at Bulimba Station "B," City Electric Light Co. Ltd., Brisbane. B.o.T. (Ref. CRE (IB) 41851/50).*

March 24.—Manchester Education Committee.—Electrical engineering work for extension to Municipal College of Technology, comprising switchboards, a.c. and d.c. distribution networks, general and local lighting installations, safety lighting, power wiring, general purpose plugs, internal telephones, tubing for G.P.O. telephones, electric impulse clock installations, fire alarms, temporary space heating, temporary domestic hot-water supplies, etc. Architects, Bradshaw, Gass and Hope, 19 Silverwell Street, Bolton. Deposit £2 2s. Applications by February 17.

March 24.—Edinburgh T.C.—Electric lighting and power installations in 212 houses and 15 shops at Inch housing area. City Architect, City Chambers, Edinburgh.

No date stated.—Lancs C.C.—Electrical installation at Fulwood secondary modern school. Apply to County Architect, County Offices, Preston, by February 25.

No date stated.—Salford T.C.—New switchboard for lighting in Royal Technical College. Principal, Royal Technical College, Peel Park, Salford.

Due to limitation of space, Overseas Contracts are only published twice in the above section. A complete list is available for reference at our offices.

CONTRACTS CLOSED

Argentina.—MARCONI'S WIRELESS TELEGRAPHIC CO, LTD. has obtained an order valued at £125,000 for two 100 kW transmitters.

Doncaster T.C.—Supply of 16 miles of 4/0 S.W.G. HD. grooved cadmium copper trolley wire for renewal of overhead lines on Beckett Road, Wheatley Hills and Hexthorpe trolley bus routes. BRITISH INSULATED CALLENDER'S CABLES, LTD., £4,260 (recommended).

New Zealand.—Centralised railway traffic control equipment for South Island main trunk railway between Oamaru and St. Leonards. METROPOLITAN-VICKERS; G.R.S. LTD. Approximately £40,000.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Coils (Beeston) Ltd.—Mr. E. Winstanley, 13 St. Peters Gate, Nottingham, appointed liquidator at meeting on January 24. Creditors to send particulars of claims by February 28.

Voluntary Liquidation

Weldona Electrical Appliances Ltd., lately of Upper Lewes Road, Brighton.—At a meeting of creditors a statement of affairs showed liabilities amounting to £775. Assets were estimated to produce £299 and, after allowing for preferential claims, there was a creditors' deficiency of £518. Issued share capital amounted to £400 and, so far as the shareholders were concerned, there was a total deficiency of £918.

It was reported that the company was registered in September, 1944, under the name of Weldona Radio Accessories, Ltd., with a nominal capital of £200. In April, 1949, the name was changed to Weldona Electrical Appliances, Ltd., and the nominal capital increased to £1,000, of which £400 had been issued. Trading accounts disclosed that for the year to September 30, 1945, sales amounted to £1,411 and there was a net loss incurred of £21.

In the following year, sales totalled £1,998, with a gross profit of £961, but there was a net loss of £108, and for the year ended September 30, 1947, there was a further net loss sustained of £70 on sales of £2,676. No accounts had been prepared since September 30, 1947, and on December 13, 1949, the business was closed down. A resolution was passed confirming the voluntary liquidation of the company with Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, as liquidator.

BANKRUPTCY ACTS

Receiving Orders

Salford.—Arthur Smith, residing at 3 Lindsay Avenue, Swinton, and lately residing at 521 Bolton Road, Pendlebury, and James Smith, residing at 14 Heron Street, Pendlebury, formerly carrying on business in co-partnership at 550 Bolton Road, Pendlebury, under name or style of "J. and A. Smith," as electrical contractors.

Wolverhampton.—J. H. Bourne, "The Beeches," Cobden Street, Woolaston, near Stourbridge, carrying on business under the style of "The Amplifier Illumination Company," at Rayleigh Works, Powlett Street, Wolverhampton, electrical fittings and fancy goods manufacturer. Also carrying on business in partnership with another under the style of "E. Desborough and Sons," at Rayleigh Works, electro platers. Public examination at The Court House, Queen Street, Wolverhampton, on March 22 at 2.30 p.m.

Dividends

Birkenhead.—W. M. Horsfall, of Heath Lodge, Hooton, carrying on business as electrical engineer at 7 Redcross Street, Liverpool. Supplemental dividend of 11s. 3¾d. per £1, plus 4% statutory interest. Payable at The Official Receiver's Office, West Africa House, 25 Walker Street, Liverpool 2, on February 17.

First meetings

High Court of Justice.—Electrical Fitting Co., Ltd., 91 Hamilton Road, Felixstowe, Suffolk. Creditors meeting at 4th Floor, Columbia House, Aldwych, W.C.2, on February 21 at 2.30 p.m. Contributories meeting at 4th Floor, Columbia House, Aldwych, W.C.2, on February 21 at 3 p.m.

High Court of Justice.—Stamford Electrical Ltd., Park Works, Barnack Road, Stamford. Creditors' meeting at Court No. 2, Bankruptcy Buildings, Carey Street, W.C.2, on February 22, at 2.45 p.m. Contributories meeting at Court No. 2, Bankruptcy Buildings, Carey Street, W.C.2, on February 22, at 3.15 p.m.

PRICES OF CABLE MATERIALS
(at Tuesday night)

COPPER, electrolytic	£153	0	0
LEAD, good soft pig (foreign)	97	0	0
" "English" quality ...	98	10	0
TIN (99·99-75%) ... (Cash) ...	£599½		—£600
" (3 months)	£586½		—£587
ALUMINIUM, commercial purity (del.)	112	0	0
ARMOURING:			
Galv. Steel Wire (0·104 in.)	39	10	0
Mild Steel Tape (0·04 in.)	26	0	0
Note. Figures quoted are M.o.S. spot prices. For future prices the following premiums must be added:—			
For Copper delivered in 2nd or 3rd month after order (per ton) ...	2	10	0
For Copper delivered in 4th, 5th and 6th month after order (per ton) ...	5	0	0
For Lead delivered in 2nd or 3rd month after order (per ton) ...	2	0	0

BUSINESS NOTICES

Belgian company.—BRITISH OIL ENGINES S.A. has been formed, with offices at 64 Boulevard Emile Jacqmain, Brussels, to sell in Belgium diesel engines made by firms in or associated with the Associated British Oil Engines Group and the turbines and electrical products of The Brush Electrical Engineering Co. The directors of the new company are: Hon. A. C. Geddes, Dr. J. W. Bondi, Mr. A. H. Syme, and Mr. M. Antoine Buysse.

Change of Phone No.—The telephone number of the Brighton office of BRITISH INSULATED CALLENDER'S CABLES, LTD., is now Brighton 29212/3.

Hire Purchase.—VACUUMS, LTD., Aldridge Road, Birmingham 22b, offer to assist retailers with hire purchase sales. Enquiries should be sent to the secretary.

Change of Name.—The name of E. F. ELECTRO, LTD., Willow Lane, Watford, has been changed to E. F. ELECTRIC, LTD.

PROSPECTIVE BUSINESS

Beverley T.C.—Erection of 36 houses on Swinemoor estate, Beverley. Corporation's Architects, Anthony Steel and Owen, Astragal House, 199 Anlaby Road, Kingston-upon-Hull.

Billingham U.D.C.—(a) Erection of 62 houses on Roseberry Road site; (b) 4 combined houses and shops on Billingham Junction estate. Architects: Kitching and Co., 21 Albert Road, Middlesbrough.

Blackpool.—Erection of shops and flats at Carleton, near Blackpool. Fairbrother, Hall and Hedges, Barclays Bank Chambers, 2 Birley Street, Blackpool.

Blandford Forum T.C.—Erection of 20 dwellings on site adjoining Kings Road. Architect, L. Magnus Austin, 51 Towngate Street, Poole.

Bolton T.C.—Erection of 20 bungalows on Breightmet Hall estate. Housing Director, Town Hall, Bolton.

Chepstow R.D.C.—Erection of 12 houses at Tintern. Architects, Thomas and Morgan and Partners, 23 Gelliwastack Road, Pontypridd.

Dagenham T.C.—Applications from contractors to be included on approved list for electrical work to be forwarded before February 25. Borough Engineer and Surveyor, Civic Centre, Dagenham.

Docking R.D.C.—Erection of 20 houses. G. E. Gibson, Housing Officer, Council Offices, Docking, Kings Lynn.

Eston U.D.C.—Erection of 16 bungalows. Council's Engineer and Surveyor, N. C. Harrison, Normanby Road, South Bank.

Faversham T.C.—Erection of 10 houses at North Preston. Borough Surveyor, Municipal Offices, Faversham.

Gateshead Education Committee.—Tenders are being obtained from selected firms for electrical installations at Redheugh kitchen/dining-room. Plans by Chief Architect, Municipal Buildings, Gateshead.

Gillingham T.C.—Erection of 62 houses on Eastcourt/Twydall estate. Borough Surveyor, Municipal Building, Gillingham.

Kildare C.C.—Erection of 26 labourers' cottages at Rathangan. J. J. Mullaney, County Secretary, Housing Section, District Hospital, Naas.

Longbenton.—Proposed ice rink at Four Lane End for Mr. G. Powell of Jesmond, Newcastle-on-Tyne, estimated to cost £300,000. Architect, C. S. Errington, 46 Grainger Street, Newcastle-on-Tyne.

Newcastle Emlyn R.D.C.—Erection of 10 dwelling houses at Llanllwni, Llanybyther. Council's architect, W. S. P. Cottrell, 8 Quay Street, Carmarthen.

Newcastle-on-Tyne Education Committee.—Consultants appointed for electrical work at three new schools at Benton Park, Montagu, and Ravenswood Road, Newcastle. R. W. Gregory and Partner, Pilgrim House, Pilgrim Street, Newcastle-on-Tyne.

North Cotswold R.D.C.—Erection of 6 houses at Bourton-on-the-Hill and 12 at Chipping Campden. Pemberton and Bateman, 21 Vine Street, Evesham.

Plymouth T.C.—Erection of 12 flats in three storeys at Rendle Street. E. G. Catchpole, Architect, Seymour Road, Plymouth.

Plympton St. Mary R.D.C.—Erection of 26 houses at Hooe, Plymstock. Council's architect, Council Offices, Plympton.

Salford T.C.—Construction of 263 flats and 4 shops in Eccles New Road. City Engineer's Office, Town Hall, Salford 3.

Sevenoaks U.D.C.—Erection of dwellings for Kippington Grange scheme. Five blocks of four 2-bedroom flats; 14 pairs of 3-bedroom houses (types A and B) and 5 pairs of 3-bedroom houses (types C and D). Council's Architects, Cable and Pite, South Park, Sevenoaks.

South Cambridgeshire R.D.C.—Erection of 6 houses at Balsham, 2 at Ickleton, 20 at Sawston, 6 at Whittlesford, 2 at Orwell and 4 at Whaddon. Housing Officer, County Hall, Hobson Street, Cambridge.

St. Faiths and Aylsham R.D.C.—Erection of 66 dwellings in various parishes. F. M. Dewing, Architect, 40 Prince of Wales Road, Norwich.

Stockport T.C.—Erection of 60 houses on Brinnington estate. W. F. Gardner, Borough Surveyor, Town Hall, Stockport.

Stowmarket U.D.C.—Erection of 16 houses at Recreation Road estate. Housing Surveyor, Council Offices, Ipswich Road, Stowmarket.

Walthamstow.—Erection of new outpatients' department at Connaught Hospital, Orford Road, Walthamstow E.17, for N.E. Metropolitan Regional Hospital Board. Regional Architect, 3 Queen Anne Street, W.1. Deposit £2 2s.

West Hartlepool T.C.—Health Committee approved erection of a nursery on Hartlepools trading estate at £13,000. S. Richmond, Borough Architect, Municipal Buildings, West Hartlepool

Weymouth and Melcombe Regis T.C.—Erection of 86 houses on Downclose housing estate. Office of Borough Engineer and Surveyor, 6 Pulteney Buildings, Weymouth.

Yorkshire.—Sub contracts to let for electrical installation. Lee Constructions Ltd., 6 Fairfield Road, Chesterfield.

YOUR QUERIES ANSWERED

"Katadyn" ionic silver water sterilising process, makers of? T.E.—The Candy Filter Co. Ltd., were the sole licensees in the British Isles, but have since relinquished the appointment. (17653)

"Orbit" tachometer, makers of? T.E.—Budenburg Gauge Co. Ltd., Broadheath, Manchester. (17658)

"Tala Touchlite" bedside lamps, makers of? G.L.—E. W. Stockham Ltd., 18 Camden Street, Birmingham. (17662)

"Supreme" cigarette lighter, agents for? P.E.—L. G. Hawkins and Co. Ltd., inform us that they were agents, but are now unable to undertake repairs. (17667)

"Sana-Ray" conduit fittings, makers of? T.E.—Sana-Ray Electrical Co., 185 High Street, Deritend, Birmingham. (17671)

"Davenset" battery chargers, makers of? T.E.—Partridge Wilson Co. Ltd., Evington Valley Road, Leicester. (17681)

The above are selected from the questions we have answered this week. If you have a query, send it to us.

ANSWER WANTED

Plastic S.E.S. lampholders, makers of? G.G. (17676)

COMPANY REGISTRATIONS

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Artic Fuse and Electrical Manufacturing Co. (Holdings) Ltd., Elizabeth Avenue, Birtley, Co. Durham. To take over the business of Artic Fuse and Electrical Manufacturing Co., Ltd. Cap.: £50,000. Dirs.: F. A. Ross and J. Crawford.

Abbott and Timbrell Ltd., 14 Sheep Street, Wellingborough. Electrical engineers, etc. Cap.: £3,000. Dirs.: L. B. Abbott, L. A. Timbrell and T. Fleming.

Cape Electric Tramways (1949) Ltd. British address: 4 London Wall Bldgs., E.C.2. Regd. in South Africa on May 23, 1949, to acquire the business and other assets of Cape Electric Tramways, Ltd. Cap.: £1,000,000. Person authorised to accept service: F. J. Pullen, 4 London Wall Bldgs., E.C.2.

Thornton Owen Ltd., 104/5 Nechells Place, Saltley, Birmingham. Manufacturers of and dealers in lamps and lamp stands, heating and lighting equipment, etc. Cap.: £15,000. Dirs.: G. Ireland, S. J. Baker, V. O. Boswell.

G.B.M. (Electrical) Birmingham Ltd., 55 Temple Row, Birmingham. Designers, manufacturers and repairers of and dealers in electrical, radio and telephone apparatus and accessories, etc. Cap.: £100. Dirs.: M. Mitchell and L. Brown.

Isotope Developments Ltd. To develop and turn to account the uses of radioactivity and the uses of radio-active and stable isotopes and radiations which are emitted or caused by them, etc. Cap.: £25,000. Subs.: E. Belton and A. W. Mallinson, 18 Austin Friars, E.C.

TRADE MARK APPLICATIONS

This information is extracted from the Official Journal by permission of the Controller.

Faradex. B680,822. Class 9. Electrical condensers. Steatite and Porcelain Products, Ltd., Imperial Chemical House, Millbank, London S.W.1.

Gawak. 664,287. Class 7. Conveyors (machines), cranes, electric and hand-operated pulley blocks, chaff cutting machines, etc. Geo. W. King, Ltd., Hartford Works, Walsworth Road, Hitchin, Herts.

Helikon. 684,225. Class 9. Wireless valves. Helikon Ltd., 234 Bishopsgate, London, E.C.2.

Mez. 677,880. Class 7. Electricity generators, electric motors (not for land vehicles) and electric welding machines and parts of all such goods. Moravian Electrical Eng. Works, National Corpn. Denisova 47, Olomouc, Czechoslovakia.

Penulec. 682,307. Class 9. Apparatus for the measurement and control of the flow, pressure and temperature of gases and liquids used in furnaces, oil refineries, chemical plant and in the like installations. Elliott Bros. (London), Ltd., Century Works, Lewisham, London S.E.13.

Physionic. 663,364. Electrical and scientific apparatus and instruments and parts included in Class 9 of all such goods. Charles Samuel Townsend, "Willowdene," The Avenue, Ickenham, Middlesex.

Reslosound. 681,442. Class 9. Apparatus for reproducing, recording, amplifying, measuring, transmitting or receiving sound, and parts of such apparatus. Reslosound Ltd., 359 City Road, London E.C.1.

MEETINGS TO NOTE

MONDAY, FEBRUARY 20

BIRMINGHAM ELECTRIC CLUB.—"The Manufacture of Lighting Glass," J. G. Holmes. Grand Hotel.

A.S.E.E. (Central London branch).—"Electrical Contracting," W. F. Parker. St. Ermins Hotel, London S.W.1.—6.50 p.m.

ROYAL SOCIETY OF ARTS.—"Public Lighting," J. W. Waldram (first of three cantor lectures). R.S.A., John Adam Street, Adelphi, W.C.2.—8 p.m.

TUESDAY, FEBRUARY 21

INC. PLANT ENGRS. (Glasgow branch).—"Maintenance and Repairs of Electric Motors," J. Clark. Engineering Centre, 351 Sauchiehall Street.—7 p.m.

I.E.S. (Liverpool centre).—"Cold Cathode Lighting Equipment," E. A. Langsdon. Merseyside and N. Wales Electricity Board Showroom lecture theatre, Whitechapel, Liverpool 1.—6 p.m.

INST. OF MANAGEMENT.—"The Organisation of the Electricity Supply Industry under Nationalisation," C. J. Hornsby. Corporation of Certified Secretaries, 28 Fitzroy Square, W.1.

I.E.E. (Measurements section).—"Electrical Methods of pH Measurement," G. I. Hitchcox and G. R. Taylor. Institution Buildings.—5.30 p.m.

I.E.E. (N. Western centre).—"The Design Specification and Performance of h.v. Surge Dividers," H. F. Jones and C. J. O. Garrard. Engineers' Club, Albert Square, Manchester.—6.15 p.m.

A.S.E.E. (London National lecture).—"Electricity and Heat Supplies from Thermal Electricity Generating Plant," C. G. Carrothers, read by F. W. Shilstone. Lighting Service Bureau, Savoy Hill, W.C.2.—6.30 p.m.

WEDNESDAY, FEBRUARY 22

I.E.E. (Southern centre).—"A Royal Air Force Calibration Centre," W. H. Ward. R.A.E., Technical College, Farnborough Road, Farnborough.—6.30 p.m.

BRIT. INSTN. RADIO ENGRS (W. Midlands section).—"Electronics and the Brain," H. W. Shepton. Wolverhampton and Staffordshire Technical College, Wulfruna Street, Wolverhampton.—7 p.m.

I.E.S. (Edinburgh centre).—"The Illuminating Engineer's Approach to Lighting Problems," W. T. Souter. Welfare Club Hall, City of Edinburgh Lighting and Cleansing Dept., High Street, Edinburgh.—7 p.m.

I.E.E. (Supply and Utilisation section).—"The Cost and Efficiency of Earthing on Low and Medium Voltage Overhead Line Systems," L. Gosland. Institution Buildings.—5.30 p.m.

A.S.E.E. (Luton branch).—"Factory Distribution and Layout," W. F. Parker. George Hotel, George Street, Luton.—7.45 p.m.

A.S.E.E. (South-east London branch).—"Telephone Exchange Work," W. H. Dibbin. (Joint meeting with S.E. London Electrical Engineering Society). S.E. London Technical College, Lewisham Way.—8 p.m.

THURSDAY, FEBRUARY 23

JNR. INSTN. ENGRS. (proposed E. Midland group).—Three ten-minute papers followed by discussion. Mechanics Institute, Burton Street, Nottingham.—7 p.m.

E.A.W.—"Points to look for in choosing your new Electrical Equipment for the Home," Miss Reading. 35 Grosvenor Place, S.W.1.—2.15 p.m.

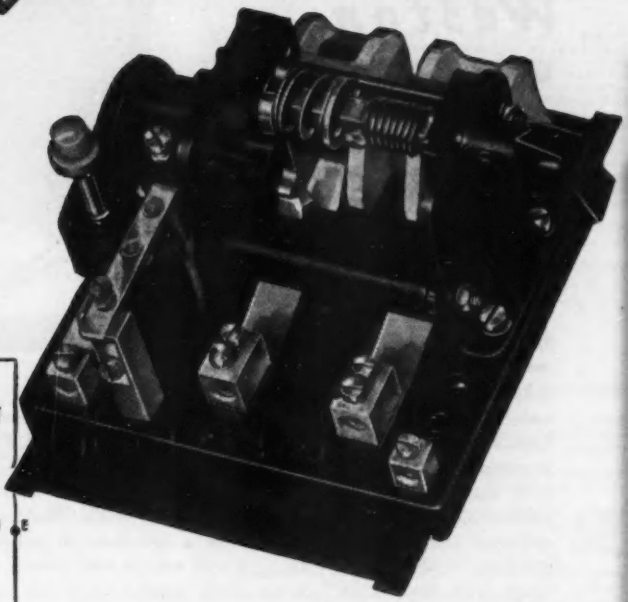
FRIDAY, FEBRUARY 24

I.E.E.—"The Application of Gas Turbine Technique to Steam Power," J. F. Field. Joint meeting with Institution Mech. Engrs. Storey's Gate, St. James's Park, S.W.1.—5.30 p.m.

I.E.E. (N.E. Students section).—"Switchgear—Old and New," T. W. G. Hart and K. W. Stanger. Grey Hall, King's College, Newcastle.—7 p.m.

ROBUST

yet sensitive..



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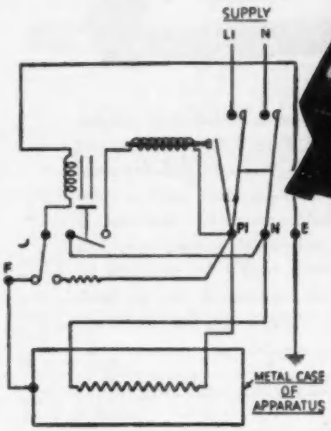
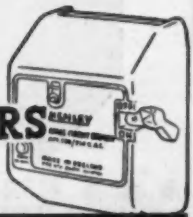


The design of the HENLEY Earth-Leakage Circuit-Breaker incorporates an entirely new method of operation with a complete absence of toggles and delicate mechanism. The full mains voltage is utilized to operate the Circuit-Breaker by means of an integral relay system. Complies with B.S. 842-1939. Full details in Booklet P./53A.

HENLEY

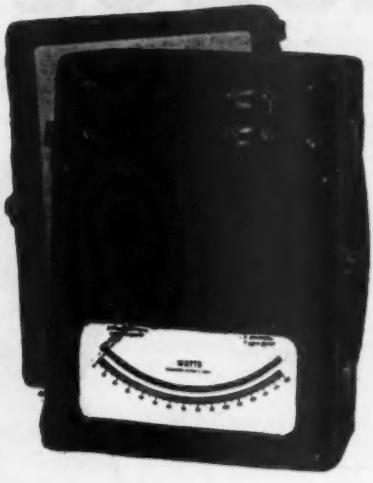
EARTH-LEAKAGE CIRCUIT-BREAKERS

(VOLTAGE OPERATED)



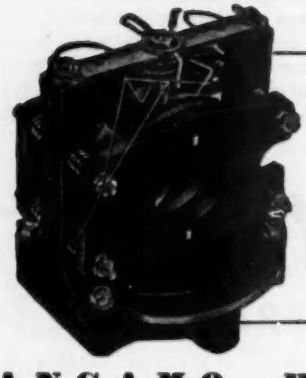
W.T. HENLEY'S TELEGRAPH WORKS CO. LTD. 51-53 HATTON GARDEN, LONDON, E.C.1

FEATURES OF WESTON SUPERIORITY



Weston
DYNAMOMETER SUB-STANDARD INSTRUMENTS

This latest development of the well-known 'Weston' sub-standard Wattmeter is made in three models, each of high-grade dynamometer type, designed for a wide range of precision measurements. The standard series is particularly suitable for meter standardisation and for use as a transfer standard between A.C. and D.C. circuits. Type 2 is recommended for low power factor circuits and Type 3 for higher power frequencies. Similar in size and design, each is housed in a lightweight Bakelite case, with easy reading 6″ scale, knife-edge pointer and anti-parallax mirror. The moving element is fitted with spring-loaded jewels, double magnetic shielding is employed and each instrument carries a certificate of individual performance and guarantee of accuracy to 0.25%. Ample voltage and current ranges are available by simple switching which can be safely applied when the instrument is on load. Model 867 (as illustrated). Size 11″ × 9½″ × 6½″. Weight 10 lbs. (approx.)



EXTREME RIGIDITY. An unique feature of these 'Weston' models is the self-contained assembly independent of the casing, thus ensuring extreme rigidity. The whole instrument is housed as one complete unit in an attractive Bakelite case with leather carrying strap and detachable cover. Ample shielding and the absence of metal parts eliminate errors due to external magnetic fields and eddy currents.

SANGAMO WESTON LIMITED

ENFIELD, MIDDLESEX - Tel.: Enfield 3434 (6 lines) & 1242 (4 lines)

Depots at Glasgow, Newcastle-on-Tyne, Manchester & Wolverhampton.

CLASSIFIED ADVERTISEMENTS

Official Tenders and Appointments · Situations Vacant · For Sale · Wanted

TENDERS INVITED

COULSDON and PURLEY URBAN DISTRICT COUNCIL

FLUORESCENT LIGHTING FITTINGS

TENDERS are invited for the supply and delivery of Fluorescent Lighting Fittings for the Council Offices, of the Metropolitan Vickers Electrical Company Type No. 292034 for single tube fittings, and Type No. 292234 for twin tube fittings.

Seventy-three single tube fittings and 4 twin tube fittings are required. Prices for all fittings to include for 200/250 V. 80 W. 5 ft Fluorescent Lamps, Type M.C.F./U, natural colour, including purchase tax, Lampholders, Starter Switches and auxiliary gear, and 18 in. Tube Suspensions with Hooks and Ball and Socket Ceiling Plates and Back Nuts, enamelled cream to match fittings.

Tenders to be addressed to the undersigned in sealed envelopes endorsed "Tenders for Fluorescent Lighting Fittings," and to be received not later than noon on Wednesday, March 1, 1950.

The Council do not bind themselves to accept the lowest or any tender and reserve the right to decline all or any of the tenders received.

ERIC F. J. FELIX,
Clerk of the Council.

Council Offices, Purley.
February, 1950. (D 644)

APPOINTMENTS VACANT

None of the vacancies in these columns relate to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1947, or the vacancy is for employment excepted from the provisions of that Order.

SOUTH WESTERN ELECTRICITY BOARD

Weston District

APPOINTMENT OF ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the appointment of Assistant District Engineer, Weston District, with headquarters at Weston-super-Mare at a salary of £617 p.a. (Grade 5, Class "G," N.J.B. Schedule). This salary is provisional pending the adoption of nationally negotiated scales.

The successful applicant's duties will include matters relating to preparation of system improvement schemes, capital sanction applications, maintenance of protective gear and fault location, and operation of district transport.

Associate or graduate membership of the I.E.E. will be an advantage.

Detailed applications to be submitted to Assistant Secretary (Establishments), South Western Electricity Board, Electricity House, Colston Avenue, Bristol 1, within ten days. (D 650)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the appointment of CLERK OF WORKS to supervise civil engineering contracts for the erection of transmission sub-stations and lines in the above Division, at a salary of £480 by £15 to £525 per annum.

The above salary is provisional and subject to negotiation through the appropriate national machinery.

Applicants should have been engaged on civil engineering works involving pile driving, foundation and reinforced concrete and building work.

The candidate appointed will be required to reside in the first instance near the proposed works at Trostre, near Llanelly, but this will be for a period probably not exceeding six months. Similar works in other parts of the South Wales Division will be started later, and subject to satisfactory service, the successful candidate will be offered the opportunity of continuing as Clerk of Works for these. In this event, he may be required from time to time to live at different centres appropriate.

Forms of application may be obtained from the Divisional Secretary at the address below, to whom completed applications should be returned not later than February 27, 1950, in sealed envelope endorsed "Clerk of Works."

H. V. PUGH,
Divisional Controller.

Cardiff (Pengam Moors) Airport, Cardiff.
February 7, 1950. (D 622)

NORTH WESTERN ELECTRICITY BOARD

No. 2 Sub-Area

APPOINTMENT OF SENIOR ASSISTANT TO DISTRICT ENGINEER CHORLEY DISTRICT

APPLICATIONS are invited for the position of Senior Assistant District Engineer in the Chorley District of the No. 2 Sub-Area at a salary in accordance with Class "G," Grade 5, of the National Joint Board's Schedule, i.e. £606-£677-£686 per annum. This salary is provisional, pending the conclusion of national negotiations and is subject to deductions for superannuation purposes.

The engineer appointed will be required to assist the District Engineer in all work in connection with district organisation, which covers construction work on high and low voltage services and extensions, the maintenance and operation of the high and low voltage distribution system within the district, and the preparation of estimates and reports in connection with the work required under the district organisation.

Preference will be given to applicants who are corporate members or graduates of the Institution of Electrical Engineers or who hold exempting qualifications.

Applications, stating age, education, qualifications and experience, present position and salary, should be received by the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester, 8 not later than Saturday, March 4, 1950. (D 641)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

ASSISTANT MECHANICAL MAINTENANCE ENGINEER LONGFORD GENERATING STATION

APPLICATIONS are invited from suitably qualified engineers for the post of Assistant Mechanical Maintenance Engineer at Longford Generating Station, Coventry.

Candidates should have a sound engineering training and be thoroughly conversant with repairs and maintenance of a large generating station.

Commencing salary in accordance with Class "J," Grade 8 of the National Joint Board Schedule, at present £562 rising to £586 per annum. The appointment will be superannuable under terms and conditions of the British Electricity Authority's Superannuation Scheme.

Applications to be submitted on forms obtainable from the Divisional Establishments Officer at the undermentioned address and when completed to be returned not later than February 24, 1950.

W. S. BURGE,
Divisional Controller.

British Electricity Authority,
British Electricity House, Barker Gate, Nottingham.
(D 570)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for appointments as ASSISTANT CHEMISTS at (a) Ironbridge, (b) Mexford, and (c) Hams Hall Generating Stations. The commencing salaries will be: (a) £493 (Class "K," Grade 9), (b) £494 (Class "J," Grade 9b), and (c) £524 (Class "O," Grade 10).

Candidates should have had a good experience in a modern power station laboratory covering the analysis of fuel, water, and oil, and be thoroughly conversant with water softening and treatment. A knowledge of and experience in corrosion and boiler fouling problems will be an advantage.

Preference will be given to applicants possessing A.R.I.C. or a British university degree, but consideration will be given to candidates holding other suitable qualifications.

Salary and conditions of service will be in accordance with the N.J.B. Agreement, and superannuation under terms and conditions approved by the British Electricity Authority.

Applications should be made on forms obtainable from the Divisional Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13. Applicants should state the position for which they desire to be considered, and completed forms should be received not later than March 4, 1950.

F. W. LAWTON,
Divisional Controller.
(D 662)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPOINTMENT OF DEMONSTRATOR

APPLICATIONS are invited for the appointment of a Demonstrator in the Liverpool Service Centre of No. 1 Sub-Area of the Board.

Applicants should hold the E.A.W. Housecraft Diploma or a certificate or diploma from an approved Domestic Science Training College.

The salary offered is within the range of £270/£316 per ann. in accordance with Grade "A" of the Extended Interim Scheme of Salaries and Conditions of Service of the National Joint Council for the Electricity Supply Industry (Administrative and Clerical Grades), and will be subject to such adjustment as may be necessary to conform to the revised salary scales to be agreed by the National Joint Council.

The successful candidate may be required to undergo a medical examination, and if eligible, will be required to contribute to a superannuation scheme.

Application forms may be obtained from the Manager, No. 1 Sub-Area, Merseyside and North Wales Electricity Board, 24 Hatton Garden, Liverpool 3, and should be returned to him so as to be received not later than Tuesday, February 28, 1950.

JAMES RANKIN,
Secretary.
(D 656)

CUMBERLAND COUNTY COUNCIL

County Architect's Department

APPOINTMENT OF ASSISTANT ELECTRICAL ENGINEER

APPLICATIONS are invited for appointment to the post of Assistant Electrical Engineer, at a salary in accordance with Grade V, A.P.T. Division (£520-£570 per annum).

Applicants are required to be at least Graduate Members of the Institution of Electrical Engineers; to have had a regular training in Electrical Installation work with subsequent experience, preferably with a local authority, in the preparation of schemes, estimates, specifications and drawings for electrical installations; in the supervision of work in progress, and in the final testing, acceptance and certification of completed installations.

Ability to drive a motor car and the possession of a private car would be advantages. A car allowance is payable for use in connection with County Council duties under the County Council scale of allowances.

The appointment will be terminable by one month's notice on either side and will be subject to the provisions of the Local Government Superannuation Act 1937, and to the passing of a medical examination.

Forms of application may be obtained by written request enclosing an addressed foolscap envelope to: J. H. Haughan, F.R.I.B.A., County Architect, 15 Portland Square, Carlisle, not later than March 3, 1950. Forms should be returned duly completed to the County Architect, not later than March 14, 1950.

G. N. C. SWIFT,
Clerk of the County Council.
(D 652)

BRITISH ELECTRICITY AUTHORITY

Merseyside and North Wales Division

APPLICATIONS are invited for the following appointments in the Construction Department at Divisional Headquarters, Liverpool:—

(a) SECOND ASSISTANT CONSTRUCTION ENGINEER, at a salary within the range £707 8s. to £838 13s. per annum.

(b) Two THIRD ASSISTANT ENGINEERS, at a salary within the range £534 3s. to £665 8s. per annum.

The salaries are to be regarded as provisional, pending negotiations between the Authority and appropriate Association.

Applicants for:

(a) Should possess an engineering degree or equivalent qualification, and preferably have had some experience in either site construction of modern power stations, or experience on the contract side of similar work.

(b) Should possess the Higher National Certificate in either electrical or mechanical engineering, and have had practical experience in the construction or operation of modern power stations or, alternatively, have had considerable experience on the electrical side of such stations.

The appointments will be subject to medical examination and will be superannuable under the British Electricity Authority and Area Boards' Superannuation Scheme.

Forms of application can be obtained from the Divisional Secretary, British Electricity Authority, Merseyside and North Wales Division, Clarke Gardens, Wootton, Liverpool, and should be returned to him in a sealed envelope so as to be received not later than first post on Monday, March 6, 1950.

A. R. COOPER,
Divisional Controller.
(D 635)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

South Caledonia Area

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT ENGINEER.

Candidates should possess a degree of electrical engineering or a Higher National Certificate, and have served an apprenticeship, preferably with a manufacturing firm, followed by several years' experience with a supply undertaking.

Candidates must be capable of dealing with calculations for protective gear settings, taking charge of protective gear, substation switchgear erection and maintenance, operation maintenance and fault location on h.v. and l.v. underground cables and networks. The candidates must also be capable of supervising personnel, and dealing with records and statistics associated with the work.

The present salary for the position offered is £565 per annum, corresponding to Grade "G" 7, but will be subject to adjustments by appropriate negotiating machinery.

Applications to be received within 10 days of this notice, and to be addressed to Area Manager, North of Scotland Hydro-Electric Board, South Caledonia, Blackfriars, Perth. (D 630)

BRITISH ELECTRICITY AUTHORITY

London Division

SENIOR CONTROL ROOM OPERATOR

BATTERSEA GENERATING STATION

APPLICATIONS are invited for the position of Control Room Operator at Battersea Generating Station.

Candidates should have received a good engineering training and experience, preferably have gained a National or Higher National Certificate in Electrical Engineering.

Salary in accordance with the N.J.B. Schedule, Class "M," Grade 9.

Applications, stating age, qualifications and experience, should be addressed to the Acting Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within fourteen days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(D 613)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following vacancies in the System Operation Department:—

(i) FIRST ASSISTANT CONTROL ENGINEER
(ii) GENERAL ASSISTANT ENGINEERS

Applicants should have had practical training and have technical qualifications up to Graduate I.E.E. standard.

The commencing basic salary for (i) will be within the range £534 3s., rising to £665 8s., and for (ii) £392 8s., rising to £523 13s. To both will be added a London allowance of 5%, with a minimum of £25 per annum. These salaries are provisional and subject to further negotiation with the appropriate organisation.

Applications for the foregoing vacancies, stating age, qualifications, and experience, should be addressed to the Acting Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within 14 days of the appearance of the advertisement.

J. N. WAITE,
Divisional Controller.
(D 680)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment:—

SHIFT CHARGE ENGINEER—Bedford Generating Station. Salary in accordance with N.J.B. Schedule, Grade 8, Class "H" (£520-£547 per annum).

Applicants should have served an apprenticeship and obtained a Higher National Certificate in Electrical and/or Mechanical Engineering or equivalent and possess experience in the operation of power stations. Experience in the operation of plant at high steam pressure will be an advantage.

The salary is in accordance with the scale at present operating but may be subject to negotiation through the medium of the Joint Board.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' superannuation scheme.

Applications, stating age, experience and present position should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than February 24, 1950. Envelopes should be endorsed "Shift Charge Engineer, Bedford."

W. N. C. CLINCH,
Controller.
Northmet House, Southgate, N.14. (D 597)

CARMARTHENSHIRE EDUCATION COMMITTEE

Llanelly Technical College

APPLICATIONS are invited for the post of FULL-TIME LECTURER IN ENGINEERING.

Candidates should be graduates or hold equivalent qualifications in engineering. Teaching and industrial experience would be an advantage.

Teaching duties may include classes in the Secondary Technical School and part-time day and evening classes in the Technical College.

Salary in accordance with the Burnham Technical Scale, with increments for previous teaching and industrial experience.

Application forms, which must be returned within *two weeks* of the appearance of this advertisement, may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope.

IORWERTH HOWELLS,
Director of Education.

County Hall, Carmarthen. (D 654)

MIDLANDS ELECTRICITY BOARD

Central Gloucestershire Sub-Area

APPOINTMENT OF ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the above position in the Stroud District of the Central Gloucestershire Sub-Area.

Applicants must have had experience in all branches of distribution work, including operation and maintenance of high- and low-voltage cables, overhead lines, sub-stations, etc. Appropriate technical qualifications will be considered an advantage.

The appointment will be in accordance with N.J.B. conditions and the provisional salary in the range of £449-£465 will be subject to negotiation.

Applications, stating full details of age, qualifications, experience, and present salary, should be forwarded within 14 days to Mr. D. Holt, Manager, Central Gloucestershire Sub-Area, Midlands Electricity Board, 126 London Road, Gloucester.

A. STEPHENS,
Secretary.
(D 647)

SOUTHERN ELECTRICITY BOARD

No. 1 (Southall) Sub-Area

APPLICATIONS are invited for the position of DISTRICT ENGINEER in the Bracknell District of the Board.

Applicants should have had sound experience in the layout, construction, operation, and maintenance of h.v. and l.v. overhead and underground distribution networks, sub-station plant, and ancillary apparatus. They should be capable of preparing a programme of work to cover future development in the District, possess sound organising ability, and recognised technical qualifications.

The provisional salary, subject to negotiation by the appropriate body, will lie within the range of £675-£725 per annum, with National Joint Board conditions. The successful applicant will be required to join the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Forms, on which application must be made, may be obtained from the Sub-Area Secretary, No. 1 (Southall) Sub-Area, Southern Electricity Board, 2-6 Windmill Lane, Southall, Middlesex, and when completed should be returned to him not later than two weeks after the appearance of this advertisement.

E. C. T. OLDCORN,
Sub-Area Manager.

2-6 Windmill Lane, Southall, Middx. (D 653)

YORKSHIRE ELECTRICITY BOARD

No. 1 (Bradford) Sub-Area

APPLICATIONS are invited for the following appointment:—

SERVICE CENTRE SENIOR DEMONSTRATOR. Vacancy No. 1/50.

Applicants should have had training in a domestic science college or have equivalent experience and should preferably hold the E.A.W. Demonstrators' Diploma. They should be competent to organise a Housecraft Advice and Public Demonstration Service and have wide experience in demonstrating and in the choice and use of all domestic appliances. A knowledge of heavy duty cooking equipment would be an advantage.

The successful applicant would normally be based at Bradford, but from time to time would be required to demonstrate and carry out Housecraft Advisory Service elsewhere in the Sub-Area.

Provisional salary £390 per annum within Grade "C."

Applications, stating the above vacancy number, giving age and full details of qualifications and experience, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53 Sunbridge Road, Bradford, within 14 days of the appearance of this advertisement. (D 634)

HIS MAJESTY'S COLONIAL SERVICE

A VACANCY exists for an ASSISTANT ELECTRICAL ENGINEER in the Chief Mechanical Engineer's Department, East African Railways and Harbours Administration. Salary in the scale £590 to £1,040 per annum, starting salary depending on age, qualifications and experience, but will not exceed £745 per annum. The post is on agreement for two years, but subject to satisfactory service the officer will be considered for the permanent and pensionable establishment. Candidates should be between the ages of 26 and 30, and must have served an apprenticeship with a firm of electrical engineers followed by a sound practical training in the installation, operation and maintenance of electrical equipment and subsequently filled a post of responsibility with a firm of electrical engineers. Candidates must be Graduates of the Institution of Electrical Engineers or equivalent qualifications.

Unfurnished Government quarters free of rent (but not of rates, etc.) provided if available or an allowance of 15 per cent. of the minimum salary of the grade in lieu. Free passages are provided. Outfit allowance of £30 on first appointment. Free medical attention and home leave at the end of two to three years at the rate of five days for each month of residential service.

Intending candidates should write for application form to the Director of Recruitment (Colonial Service), Colonial Office, Sanctuary Buildings, Great Smith Street, London S.W.1, giving brief details of age, qualifications and experience as soon as possible, quoting reference No. 27326/32. (D 657)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

SHIFT CHARGE ENGINEER
ST. SWITHIN'S GENERATING STATION, LINCOLN

APPLICATIONS are invited for the position of Shift Charge Engineer at St. Swithin's Generating Station, Lincoln.

Applicants should have had sound technical training and practical experience in the operation and control of steam generating plant and switchgear, and preference will be given to candidates who have the Higher National Certificate or its equivalent.

The salary is in accordance with Class "H," Grade 8 of the present National Joint Board Schedule, and the applicant will be superannuable under terms and conditions approved by the British Electricity Authority.

Official forms of application which are obtainable from the Divisional Establishments Officer, British Electricity Authority, British Electricity House, Barker Gate, Nottingham, should be delivered to the undersigned not later than February 24, 1950.

W. S. BURGE,
Divisional Controller.

British Electricity Authority,
British Electricity House, Barker Gate, Nottingham.
(D 660)

NORTH WESTERN ELECTRICITY BOARD

No. 4 Sub-Area

APPOINTMENT OF (a) ASSISTANT ENGINEERS (OPERATION AND MAINTENANCE) AND (b) ASSISTANT ENGINEERS (CONSTRUCTION)

APPLICATIONS are invited for the following appointments on the staff of the Mains Engineer, No. 4 Sub-Area, The North Western Electricity Board, Preston:—

(a) Assistant Engineers (Operation and Maintenance)

Applicants should have had a wide experience in the operation and maintenance of large industrial and rural networks, including both overhead lines and underground cables at voltages up to and including 33 kV; also experience in high voltage testing and fault localising.

The salary, which is provisional, pending the conclusion of negotiations by the appropriate body, is subject to deductions for superannuation purposes and will be within the range of £525 to £625 per annum.

(b) Assistant Engineers (Construction)

Applicants should be experienced in the survey, construction and operation of large industrial and rural networks, including both overhead lines and underground cables at voltages up to and including 33 kV, and should be capable of estimating for and supervising the installation of switchgear and transformers.

The salary, which is provisional, pending the conclusion of negotiations by the appropriate body, is subject to deductions for superannuation purposes and will be within the range of £400 to £625 per annum, according to qualifications and experience.

Corporate or graduate membership of the Institute of Electrical Engineers or exempting qualifications will be an advantage in each case.

Applications, stating age, education, qualifications and experience, present position and salary, should be received by G. A. Robertson Esq., M.Sc.Tech., M.I.E.E., M.I.Mech.E., Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune Street, Preston, not later than Saturday March 4, 1950. (D 638)

NORTH WESTERN ELECTRICITY BOARD

No. 4 Sub-Area

APPOINTMENT OF JUNIOR ENGINEERS (MAINS DEPARTMENT)

APPLICATIONS are invited for the appointment of Junior Engineers in each of the four districts of the No. 4 Sub-Area. The salaries for the posts will be in accordance with the National Joint Board Schedule as follows:—

4A—Preston District (District Office, Preston)
Class "H," Grade 10a, i.e. £347-£353-£360 per annum.
4B—Lune District (District Office, Lancaster)
Class "G," Grade 10a, i.e. £330-£335-£342 per annum.
4C—North West Fylde District (District Office, Fleetwood)
Class "G", Grade 10a, i.e. £330-£335-£342 per annum.
4D—South West Fylde District (District Office, Blackpool)
Class "H," Grade 10a, i.e. £347-£353-£360 per annum.

The above salaries are provisional, pending the conclusion of national negotiations and are subject to deduction for superannuation purposes.

Applicants should preferably be in possession of a national certificate in electrical engineering or hold equivalent qualifications, and should have had training and experience in electrical engineering, preferably in the mains department of a supply undertaking.

Applications, stating age, qualifications, experience, present position and salary, should be received by G. A. Robertson, Esq., M.Sc.Tech., M.I.E.E., M.I.Mech.E., Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune Street, Preston, not later than Saturday, March 4, 1950. (D 640)

BRIGHTON TECHNICAL COLLEGE

Principal: G. E. Watts, M.A., Ph.D., F.R.I.C.

APPLICATIONS are invited from suitably qualified and experienced engineers for appointment as HEAD OF ELECTRICAL ENGINEERING DEPARTMENT. Grade 2 salary scale for Heads of Departments as in Burnham Technical Report (£800-£25-£950 per annum, exclusive of graduate and training additions).

Particulars and forms of application from the undersigned. Completed forms, with two recent testimonials, to be returned to Principal, Brighton Technical College, Brighton 7, within 14 days.

W. G. STONE,
Education Officer.

Education Office,
54 Old Steine, Brighton. (D 617)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the position of ASSISTANT CONTROL ENGINEER (Shift) in the System Operation Department at Divisional Headquarters, Birmingham. The salary will be within the range of £534 3s. to £665 8s. per annum.

Applicants should be graduate members of the Institution of Electrical Engineers, and should have received practical experience in a generating station.

The salary quoted is to be regarded as provisional until final scales have been negotiated with appropriate organisations, and superannuation will be under terms and conditions approved by the British Electricity Authority.

Applications should be made on forms obtainable from the Divisional Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and be returned not later than March 4, 1950.

F. W. LAWTON,
Divisional Controller.
(D 663)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the following appointments in this division:

1. CONTROL ENGINEER, Llanelly power station, at a salary in accordance with the National Joint Board Schedule, Class "H," Grade 8B (£465-£484 per annum).
2. JUNIOR CHARGE ENGINEER, East Power Station, Newport, at a salary in accordance with the National Joint Board Schedule, Class "H," Grade 9 (£437-£453 per annum).

Applicants should preferably have obtained the Higher National Certificate or its equivalent, served a regular apprenticeship and had previous experience in the control room of a modern station.

The appointments will be superannuable under the British Electricity Authority and Area Boards Scheme.

Forms of application may be obtained from the Divisional Secretary at the address below, to whom completed applications should be returned not later than February 27, 1950, in sealed envelope endorsed with the appointment sought.

H. V. PUGH,
Divisional Controller.

Cardiff (Pengam Moors) Airport, Cardiff.
February 8, 1950. (D 643)

SOUTH WESTERN ELECTRICITY BOARD

Chief Commercial Officer's Department

APPOINTMENT OF SENIOR TECHNICAL ASSISTANT

APPLICATIONS are invited for the appointment of Senior Technical Assistant in the Chief Commercial Officer's Department at Area Board Headquarters, Bristol, at a salary of £900 per annum, which is provisional pending the adoption of nationally negotiated scales.

Candidates must have held a responsible position on the commercial side of the industry, and have had practical and administrative experience in sales contracting and development work; they should be corporate members of the I.E.E.

The successful applicant will be required to assist the Chief Commercial Officer in the development of consumer and sales services, and in the co-ordination of these and related functions throughout the area.

Detailed applications to be submitted to Assistant Secretary (Establishments), South Western Electricity Board, Electricity House, Colston Avenue, Bristol 1, within 10 days. (D 651)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT CONSUMERS' ENGINEER, Reigate District. Provisional salary £449 to £465 per annum under N.J.B., Class "F," Grade 8a. Superannuation will be arranged. Applicants must be experienced in the supervision and organisation of all types of installation work, and possess a thorough knowledge of domestic apparatus, maintenance and repairs. Experience in showroom management, sales development, and organisation an advantage.

Applications, giving two referees, must reach C. W. Hughes, Esq., B.Sc., M.I.E.E., Surrey Manager, South Eastern Electricity Board, Rough Rew, Horsham Road, Dorking, Surrey, by February 27, 1950.

A. L. BURNELL,
Secretary.

February, 1950. (D 649)

SOUTH EAST SCOTLAND ELECTRICITY BOARD

THE Board invite applications for the post of ASSISTANT ENGINEER in the Commercial Department at Area H.Q.

Applicants should have had a sound general and technical education and varied experience in the activities (including the commercial side) of an electricity supply undertaking. The salary, which will be between £450 and £575 per annum, according to qualifications and experience, is provisional pending the adoption of a nationally negotiated scale. The post is superannuable.

Applications, giving full details of training, qualifications, experience, age, present appointment and salary, should be submitted to the Chief Commercial Officer, South East Scotland Electricity Board, 52 Melville Street, Edinburgh, within fourteen days. (D 608)

NORTH WESTERN ELECTRICITY BOARD

No. 4 Sub-Area

APPOINTMENT OF ASSISTANT ENGINEERS (MAINS DEPARTMENT)

APPLICATIONS are invited for the appointment of Assistant Engineers in each of the four districts of the No. 4 Sub-Area. The salaries for the posts will be in accordance with the National Joint Board Schedule as follows:—

4A—Preston District (District Office, Preston)
Class "H," Grade 7, i.e. £590-£598-£598 per annum.
4B—Lune District (District Office, Lancaster)
Class "G," Grade 7, i.e. £534-£548-£565 per annum.
4C—North West Fylde District (District Office, Fleetwood)
Two appointments:—
(a) Class "G", Grade 8a, i.e. £474-£480-£486 per annum.
(b) Class "G," Grade 9a, i.e. £375-£384-£391 per annum.
4D—South West Fylde District (District Office, Blackpool)
Class "H," Grade 8, i.e. £520-£534-£547 per annum.

The above salaries are provisional, pending the conclusion of national negotiations and are subject to deductions for superannuation purposes.

The successful candidates will be required to assist in the operation, maintenance and construction of high and medium voltage underground and overhead mains, substations and transformers and will also be required to assist in general mains duties, including the keeping of records and to undertake standby duty.

In the case of the appointment for the 4D—South West Fylde District, applicants should have had experience in change-over supplies.

Preference will be given to candidates who are corporate members or graduates of the Institute of Electrical Engineers or who possess the Higher National Certificate in electrical engineering.

Applications, stating age, qualifications, experience, present position and salary, should be received by G. A. Robertson, Esq., M.Sc.Tech., M.I.E.E., M.I.Mech.E., Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune Street, Preston, not later than Saturday, March 4, 1950. (D 639)

BRITISH ELECTRICITY AUTHORITY

South Western Division

CHARGE ENGINEER
WESTON-SUPER-MARE GENERATING STATION

APPLICATIONS are invited for the position of Charge Engineer at Weston Generating Station. Salary and conditions in accordance with the N.J.B. Schedule, Class "C," Grade 8.

Applicants should have good technical qualifications and a sound knowledge of the operation and maintenance of generating plant, preferably in relation to Brush-Ljungstrom turbines and stoker fired boilers.

The appointment will be superannuable under terms and conditions approved by the British Electricity Authority.

Applications, stating age, qualifications and experience should be addressed to the Generation Engineer (Operation), British Electricity Authority, South Western Division, Generating Station, Portishead, Bristol, so as to be received not later than February 25, 1950.

R. C. BARRETT,
Divisional Secretary.

February 10, 1950. (D 648)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

JUNIOR SHIFT CHARGE ENGINEER—AVON

APPLICATIONS are invited for the position of Junior Shift Charge Engineer at Avon Generating Station, Warwick.

Candidates should have had a sound general and technical education, and have experience in the operation of steam power stations.

The salary will be in accordance with the National Joint Board Schedule, Class "H," Grade 6A, at present £398 per annum. This salary is provisional and subject to negotiations.

Forms of application may be obtained from the Divisional Establishments Officer at the undermentioned address, and should be returned to him not later than March 8, 1950.

W. S. BURGE,
Divisional Controller.

British Electricity House,
Barker Gate, Nottingham. (D 665)

A SENIOR ELECTRICAL ENGINEER is required for development work on motors and similar devices. Experience in the design of electrical fans and testing of magnetic materials is desirable. The work will be carried out at the Indian branch of a British company for the first two or three years, and may subsequently be continued either abroad or at home. Salary will be according to age and experience.—Apply to Box No. 1847, Electrical Times. (D 627)

APPLICATIONS are invited for the following positions in our Electric Motor Department: DESIGNER; WINDING SHOP FOREMAN; and TEST ENGINEER.—British Bronson Ltd., Stocklake, Aylesbury. (D 615)

BRITISH INSULATED CALLENDER'S CABLES LTD. have vacancies for SENIOR DRAUGHTSMEN for electric traction work—crane equipment—overhead line, outdoor switches. Permanent positions. Superannuation scheme. Salary in accordance with qualifications and experience.—Apply, in writing, to Staff Officer, B.I.C.C. Ltd., Prescot, Lancs. (D 568)

CAPACITOR ENGINEER required, with good theoretical knowledge and preferably with some experience of design and production of P.F. Correction Capacitors. Salary according to qualifications.—Apply: Technical Director, Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Surrey. (D 609)

DESIGNER required either as consultant or free-lance for switches. Experience in designing domestic electric tumbler switches essential.—Write, giving full details to: Box No. 1841, Electrical Times. (D 620)

DRAUGHTSMEN, JUNIOR and SENIOR, required, preferably with experience domestic electric appliances or other electro-mechanical detail drawing. Prospects leading to design work, good conditions, 5-day week, pension scheme.—Write, stating age, experience and qualifications to: Elexcel Limited, Victor Works, Liverpool 14. (D 621)

ENGLISH ELECTRIC require for their Acton Drawing Office, ELECTRICAL AND MECHANICAL DESIGN DRAUGHTSMAN for interesting work covering heavy electrical switchgear. Applicants should have a sound D.O. experience of switchgear work and preference will be given to those possessing the Higher National Certificate. Write, giving full details, quoting Ref. 112 to Central Personnel Services, English Electric Co., Ltd., 24 Gillingham Street, Westminster, S.W.1. (D 580)

ENGINEER required by well-known makers of water tube boilers for position of ASSISTANT OUTSIDE MANAGER involving regular visits to power stations, etc. Qualifications, sound technical knowledge, good education, experience in erection. Preferably resident London area.—Write, stating age, experience and salary required to Box G640, c/o Streets, 110 Old Broad Street, E.C.2. (D 600)

E.H.V. SWITCHGEAR. DRAUGHTSMEN required, with experience of E.H.V. indoor and outdoor switchgear layouts. Salary according to age and experience.—Apply, stating age, qualifications and experience, to Personnel Manager, A. Reyrolle and Co., Ltd., Hebburn, Co. Durham. (D 636)

ELECTRICAL INSPECTORS required by major oil company operating in Middle East. Applicants should have a wide experience of inspection and testing of motors, switchgear, and the electrical equipment associated with modern large generating stations, substations, and transmission and distribution networks with voltage range of 33 kV to 440 V. Knowledge of flameproof equipment an advantage. Possession of Higher National Certificate essential and qualifications up to A.M.I.E.E. desirable. Age limit 37 years. Attractive salary, plus generous allowance in local currency, free passages out and home, free medical attention, kit allowance, pension scheme, good leave arrangements.—Write, stating age and full details of qualifications and experience, quoting Dept. F.182, to Box 3333 at 191 Gresham House, E.C.2. (C 304)

JUNIOR DRAUGHTSMAN required for detail and assembly drawing, modifications and schedule preparation for manufacturers of electro-mechanical devices in West London area.—Write full details of experience and salary required to Box No. 1827, Electrical Times. (D 585)

JUNIOR SALES ENGINEER with graduate I.E.E. qualifications or equivalent required by large Electrical Engineering Company in the London area, to assist in the preparation of tenders for a.c. variable speed commutator motors and other similar equipment. Salary approximately £6 per week with good prospects of advancement.—Reply, stating age, education and experience, to Box No. 1851, Electrical Times. (D 632)

LIGHTING DESIGN ENGINEER to prepare fluorescent and other lighting schemes in London office of electrical manufacturers. Nat. Cert. E.E. Lighting planning and experience necessary. I.E.S. member preferred. British National about 30.—Please give full information to: Box No. 1793, Electrical Times. (D 506)

MANAGING Director of leading Electrical Wholesalers in London requires reliable PERSONAL ASSISTANT, under 35. Qualifications: good education, practical electrical engineering training, outstanding personality, sound commonsense, reliability and commercial knowledge. Excellent salary and prospects for the right man.—Applications, in writing only, to British Central Electrical Co., Ltd., 6/8, Rosebery Avenue, E.C.1. (D 637)

PRODUCTION MANAGER required for light engineering manufacturers in South Bedfordshire. Must be fully acquainted with up-to-date methods of Production Control and have sound engineering background covering mass production experience in large press shop and sheet metal fabrication and finishing. Applications, which will be treated with strict confidence, can only be considered from applicants who have held a similar position and who have been accustomed to full responsibility.—Write, stating age, present salary and full details of education and positions held, together with personal references, to Box No. 1825, Electrical Times. (D 584)

REPRESENTATIVES required for London and Home Counties. Knowledge of V.I.R. cables essential. Applicants having connection with contractors and industrial users will receive preference. Own car an advantage.—Write, stating age, experience and salary required, to The Associate Director of Home Sales, Enfield Cables Ltd., Victoria House, Southampton Row, London W.C.1. (D 572)

REQUIRED, ASSISTANT TO MANAGER with power station experience, about 35/40 years, for London office of large engineering concern.—Send full particulars and testimonials; also state salary required, to: Box No. 1855, Electrical Times. (D 645)

SALES ENGINEER required for London and Home Counties. Must be conversant with all types of cables, boxes, etc. Preference given to applicant with car, and live connection.—Write, stating age, experience and salary required, to the Associate Director of Home Sales, Enfield Cables Ltd., Victoria House, Southampton Row, London W.C.1. (D 571)

SALES SUPERVISOR required by London Manufacturers of domestic electric appliances doing business with wholesalers, large stores and shipping. Applications will only be considered from those with experience and capable of taking full responsibility. The position is a progressive one and every encouragement will be given to the right man.—Write, giving full details to: Box Z.N. 97, Deacon's Advertising, 36 Leadenhall Street, E.C.3. (D 661)

S.W. LONDON. DRAUGHTSMAN, 25 years of age, with workshop knowledge of electrical accessories.—Write, stating age, experience, and salary required, to Box No. 1845, Electrical Times. (D 625)

TRANSFORMER ASSEMBLY INSPECTOR wanted with good practical experience of Transformers up to 10,000 kVA. Salary according to qualifications.—Apply: Technical Director, Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Surrey. (D 611)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

TRANSFORMER COREPLATE FOREMAN OR CHARGE HAND required by large manufacturers in the London area. Must be experienced in core cutting, punching and building and capable of controlling the department. This is a Staff appointment with a superannuation scheme in operation.—Apply, in writing, stating age, experience, names of previous employers and salary required to: Box No. 1801, Electrical Times. (D 539)

TRANSFORMER DRAUGHTSMEN with experience on units up to about 10 MVA and, preferably, with some knowledge of on-load tap-changing gear.—Apply Technical Director, Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Surrey. (D 631)

TRANSFORMER ENGINEER. A competent transformer designer with experience in the designing of all classes of power transformers is required.—Write, stating age, experience and salary required, to: Employment and Welfare Manager, Johnson and Phillips Ltd., Charlton, S.E.7. (D 616)

WORKS INSPECTOR WANTED for fabricated and similar metal work including oiltight tanks and general plate work. Salary according to qualifications.—Apply: Technical Director, Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Surrey. (D 610)

APPOINTMENTS WANTED

ELECTRICAL AND MECHANICAL ENGINEER (40), 5 years' apprenticeship seeks responsible post, charge of maintenance, industrial power installations, fault location, repairs, a.c. and d.c. generation; some technical knowledge.—Box No. 1857, Electrical Times. (D 646)

ELECTRICAL INSPECTOR (42), recently returned from Asia, seeks situation either in U.K. or overseas. Wide experience of construction and maintenance with various types of installations, both industrial and domestic.—Box No. 1789, Electrical Times. (D 495)

ELECTRONICS CONSULTANT seeks post anywhere in South America.—Box No. 1811, Electrical Times. (D 551)

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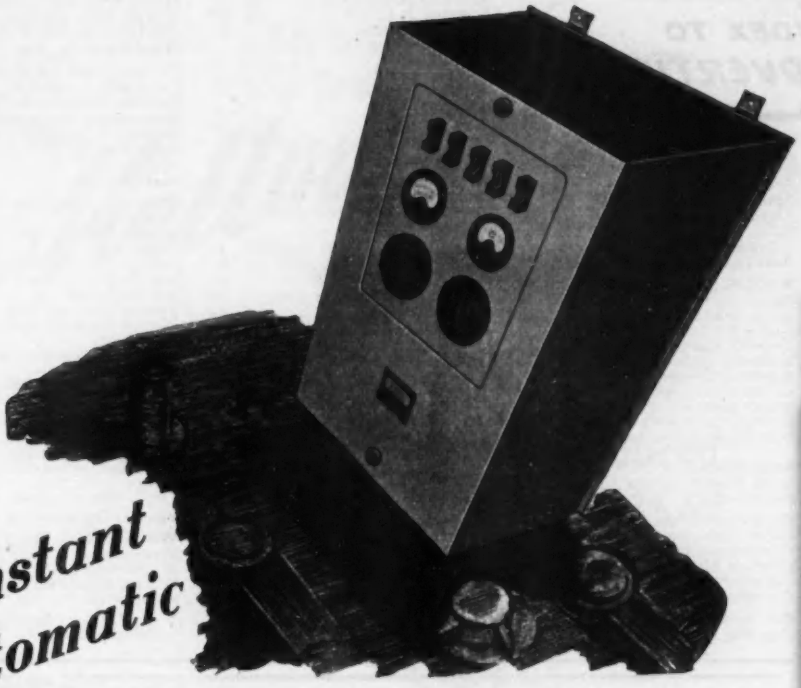
Full particulars may be obtained from:— Examinations Department, The Electrical Association for Women, 35 Grosvenor Place, London S.W.1.

IMPORTANT: The final date of entry for the Examination is May 4, 1950. (D 581)



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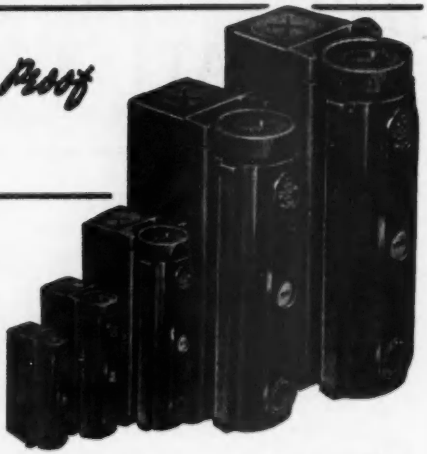

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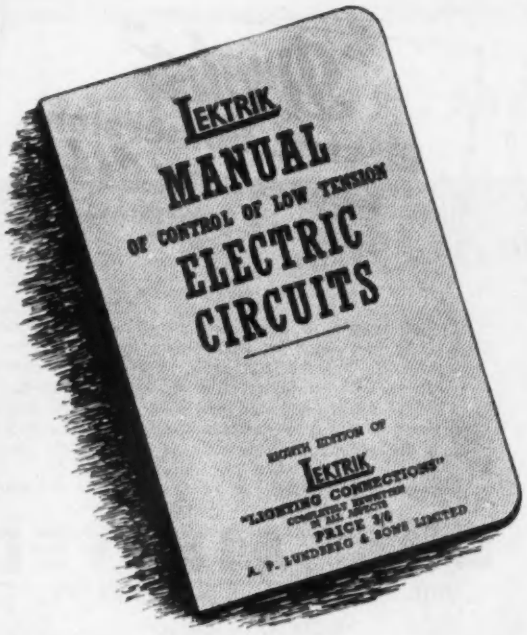

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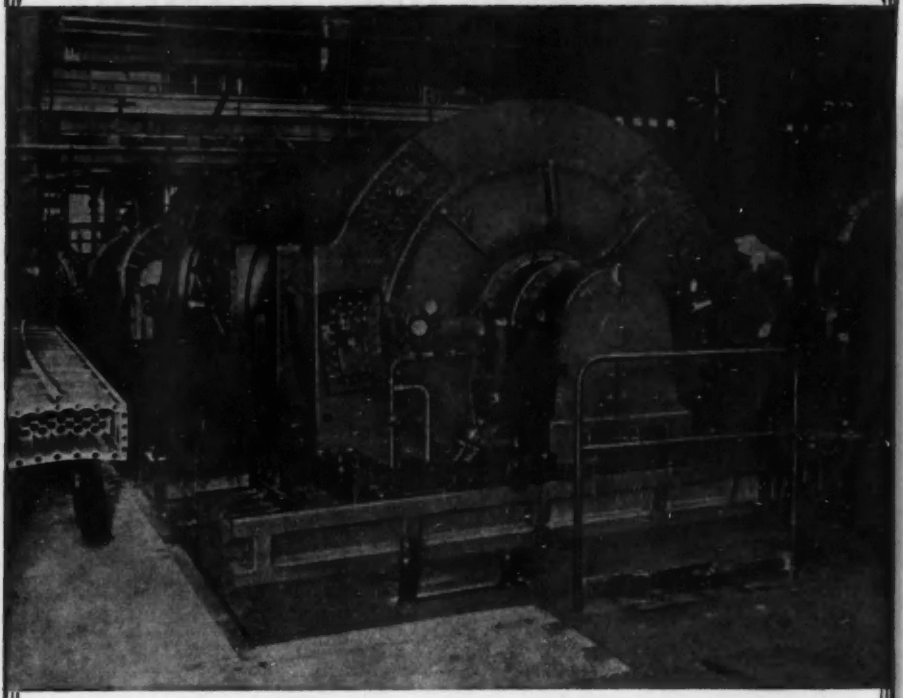

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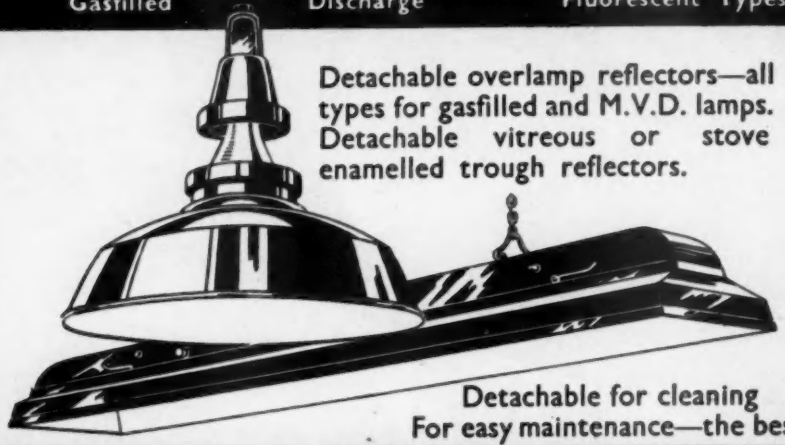

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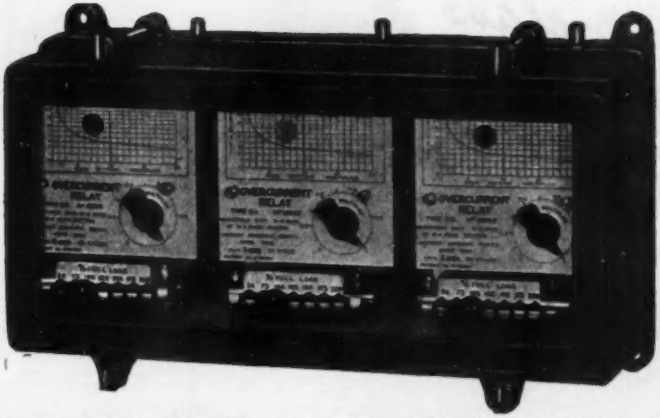

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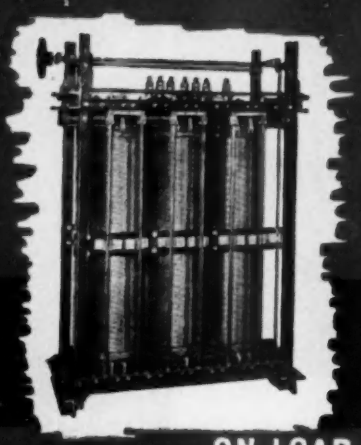

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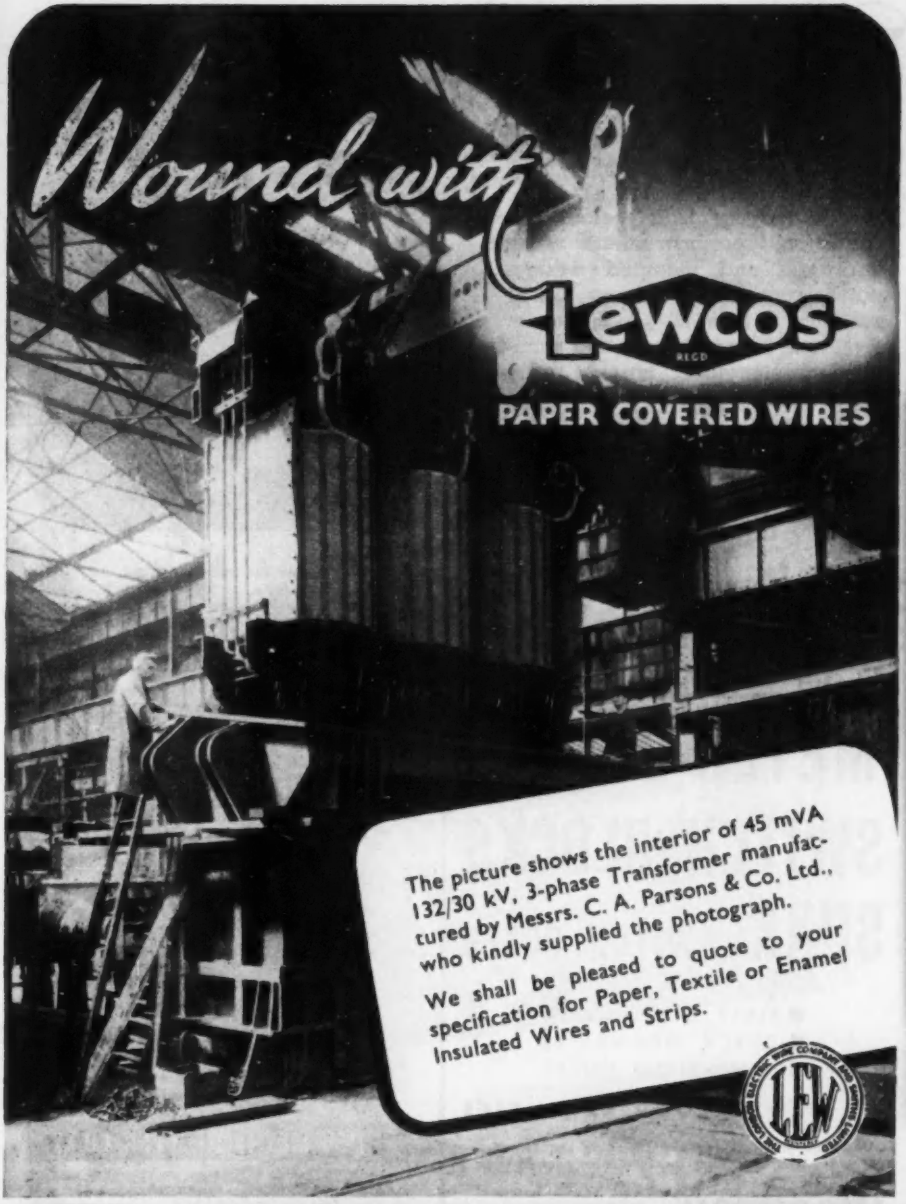
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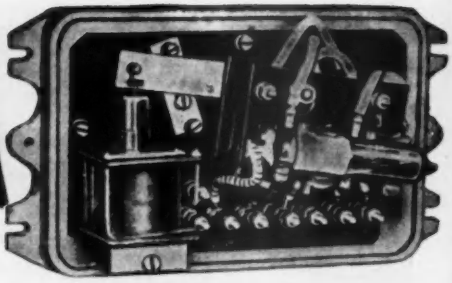

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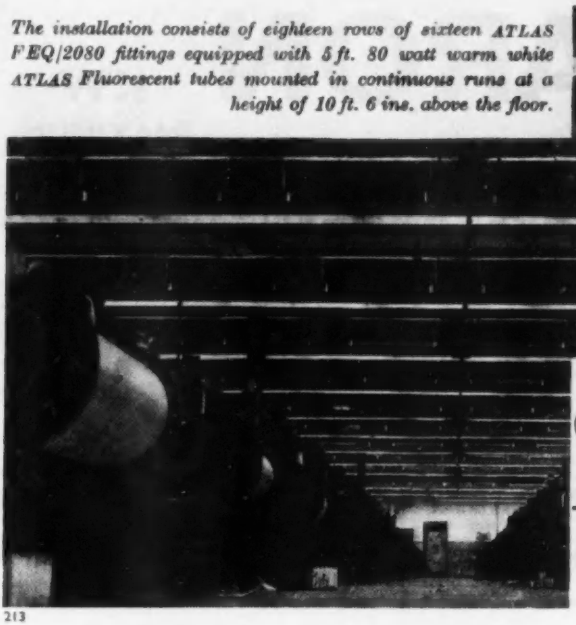

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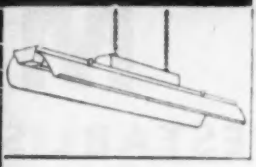

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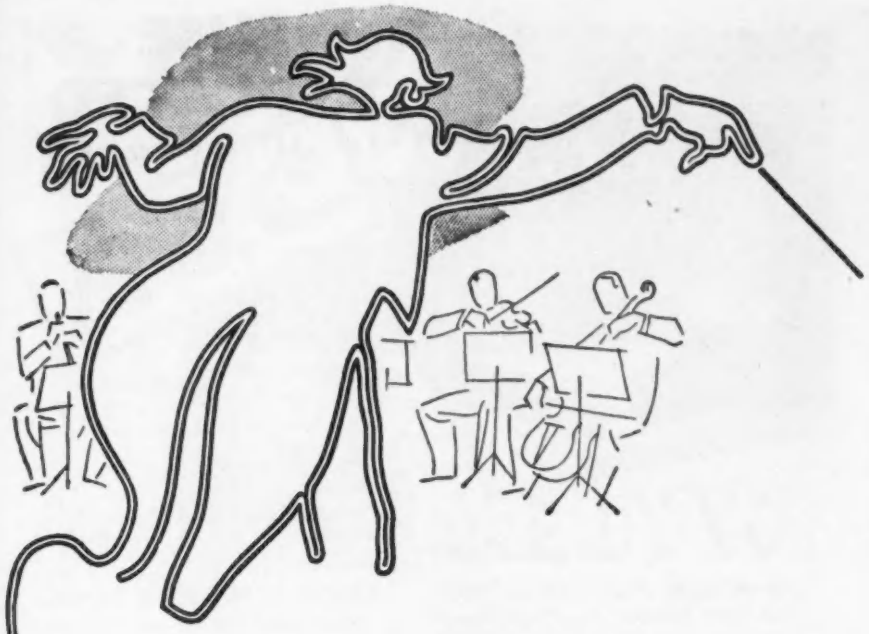

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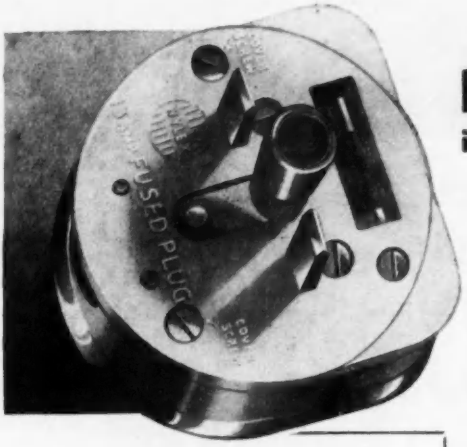

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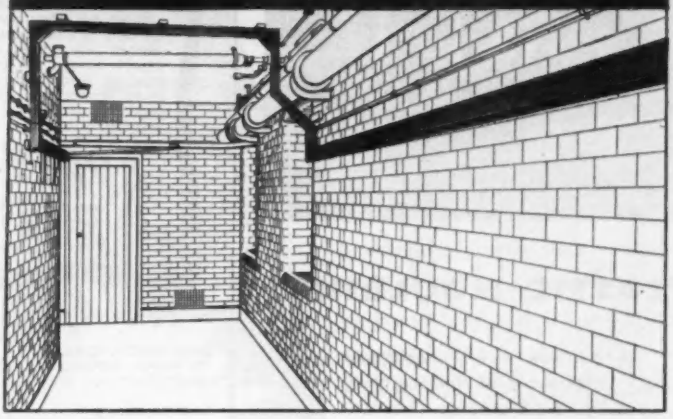

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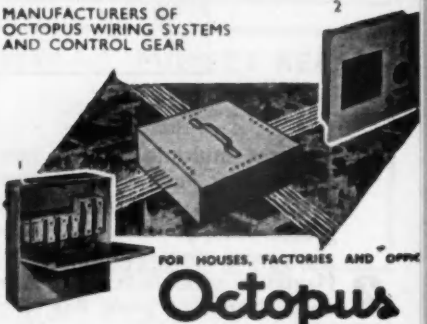

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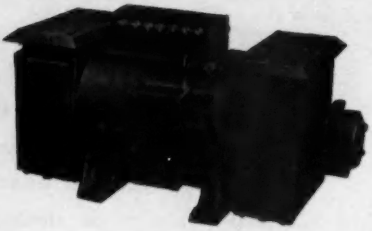

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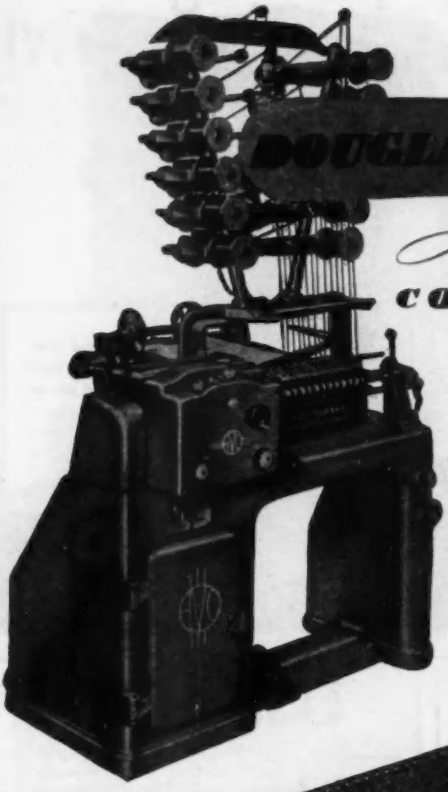

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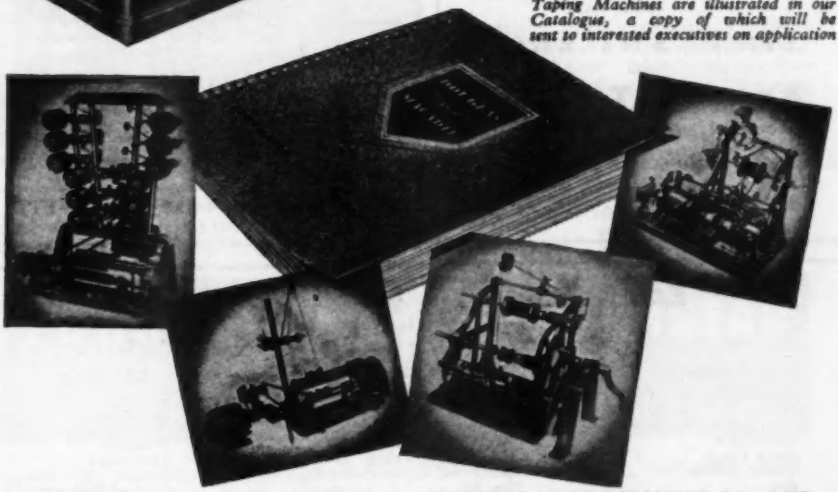

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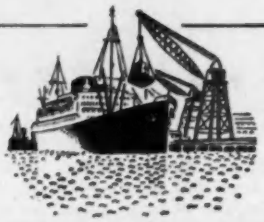

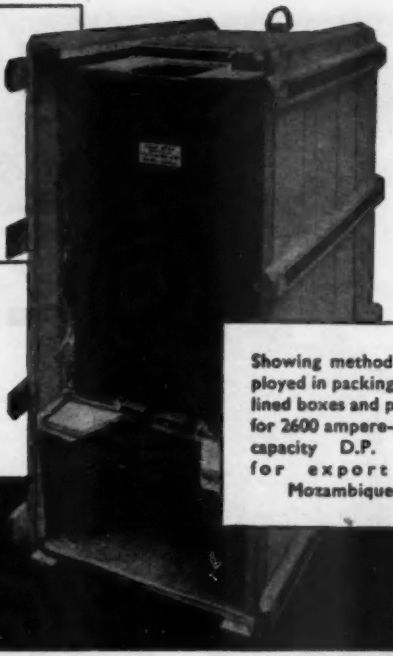

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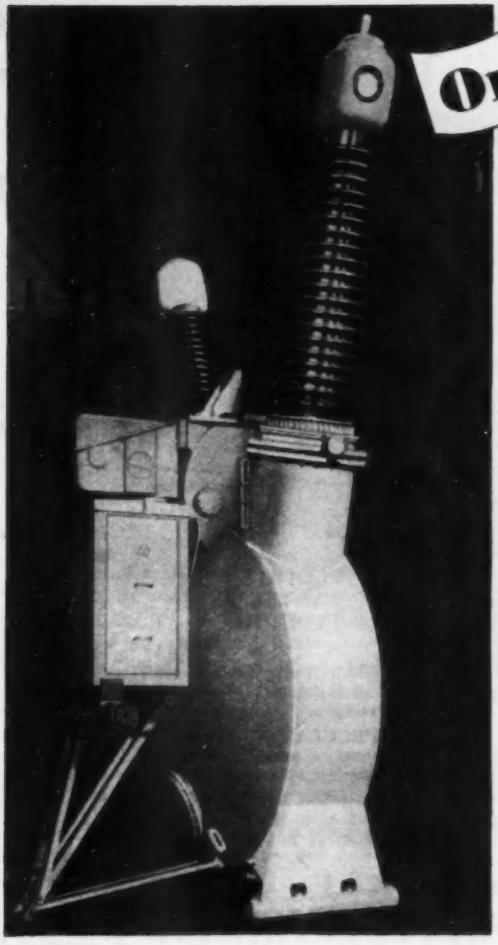

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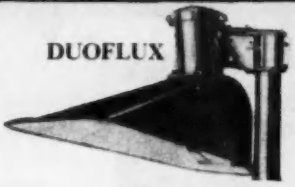

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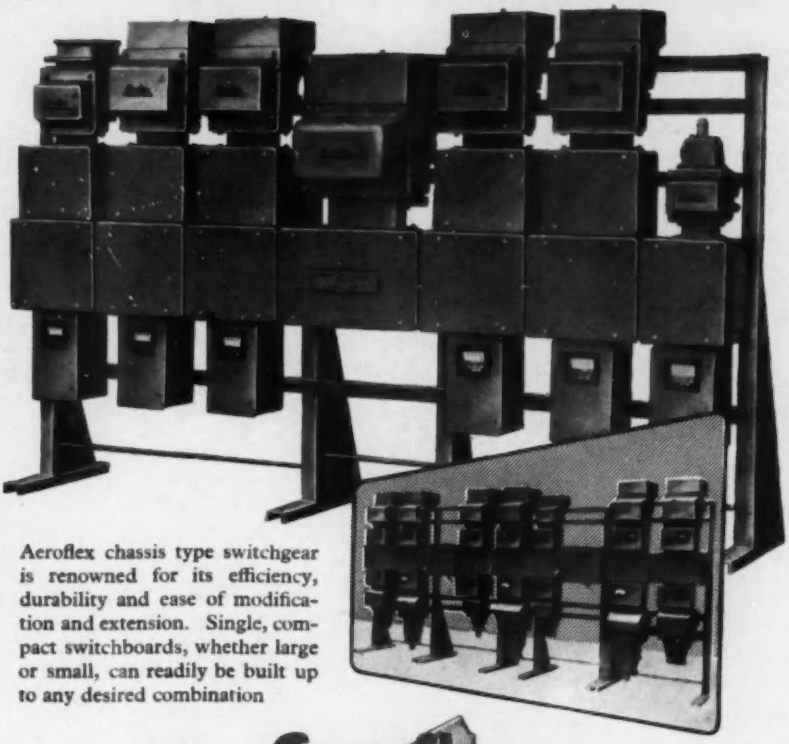

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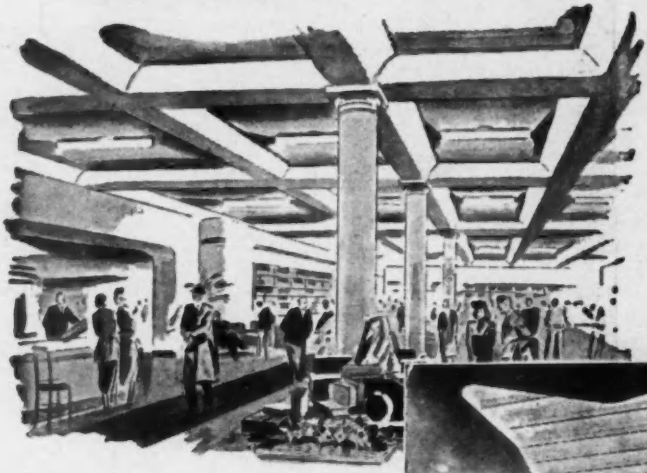

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